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LAND USE AND SOCIAL ADJUSTMENT

THE scheme outlined in the White Paper on the Control of Land Use* issued by the Government in June last, together with a Bill facilitating the public acquisition, at 1939 prices, of damaged and decayed urban areas in Great Britain for planned redevelopment as single units, although following closely the recommendations of the Uthwatt Report on this aspect of the problem, had a poor reception. The merits of the Government scheme as a means of solving the particular problem of compensation and betterment have in fact been obscured by dissatisfaction with its attitude towards the wider question of land-ownership, and with its unwillingness to adopt a positive planning policy. The importance of the latter has been emphasized by events during the recess.

It is now accepted on all sides that planning control is necessary to secure the best use of the land in the public interest, that planning control is frustrated by the practical impossibility of balancing compensation and betterment under the present system of land ownership, and that therefore this system must be modified to the extent required to make effective planning control possible. Meanwhile, the question of the best use of land, as between the claims of housing and farming, of commerce and amenities, is a matter of the utmost urgency and importance. It is no longer a question of merely saving land : it is a matter of saving and using.

The news that Britain is to be increasingly searched for oil-fields, while welcome from the point of view of self-sufficiency in war, at least carries the risk of loss to our countryside which may outweigh any commercial advantage in the long run, and is clearly a matter to be determined by national considerations and planning. So too the controversies aroused by the proposed power-stations at Durham and Lincoln, the Highland water power scheme or even the City of London Plan and the Plymouth Plan, emphasize the imperative necessity of some real national planning of resources. Each plan proposes alterations, for the benefit of specific interests, to scenes which are generally regarded as part of the national heritage, and except in the Plymouth plan, where the proposals cannot be implemented effectively except as part of a national plan backed by national resources, there is little evidence that the wider national or regional interests have been considered.

The strong criticism advanced by Mr. Hugh Quigley of the North of Scotland Hydroelectric Board Scheme approved by the Secretary for Scotland in March has never been effectively answered and indicates the unsatisfactoriness of the general situation. Constructional Scheme No. 1, covering Lochs Sloy, Morar and Lochalsh, Mr. Quigley points out, forms no part of any plan for the Highlands. Provided with inadequate maps, it contains no reference to town and country planning schemes or to economic development of any kind. The Board, instead of

* The Control of Land Use. (Cmd. 6537.) Pp. 16. (London : H.M. Stationery Office, 1944.) 3*d*. net.

preparing its own schemes, appears to have accepted those prepared by consulting engineers or requested them to prepare such schemes, and, according to Mr. Quigley, there is no evidence that the final scheme was submitted to or approved by the Amenities or Fisheries Committee. Even now the main development scheme has not been published.

Mr. Quigley's criticism cannot but arouse profound misgivings as to the whole hydro-electric development scheme for Scotland, in any event while the Minister of Town and Country Planning possesses such inadequate powers. At present, instead of drawing up a broad master plan of how such areas of national concern as Durham, Lincoln, Plymouth and Oxford, the Highlands and London, the caravan camps and the housing estates, shall be handled for the good of all, he must depute the task piecemeal to representatives of those very interests at whose hands the community and the landscape have suffered much. Local authorities have not necessarily incentive or resources to weigh with strict impartiality the national against the local, the individual against the general issues.

In a small island such as Great Britain, the liberty of the community can only be achieved by some sacrifices of individualism, and the guardian of the community's landscape can only be a national ministry. Unless, however, Mr. W. S. Morrison's office is given much greater preventive and constructive authority than at present, local and individual interests may well continue to trespass in the names of freedom and progress upon that scenic heritage which is irreplaceable.

The situation is in fact even more serious than this might suggest. Despite the acknowledged need for regional planning and for redistribution and reform in local government, the Government has indicated that it has no present intention of embarking on local government reform. It may well be doubted, in fact, if the necessary inquiry could be brought to fruition in time for effect to be given to any recommended scheme of recorganization before action on immediate post-war reconstruction and development is necessary. Reorganization cannot be postponed indefinitely, as each successive measure of reconstruction in fields such as education and health and town and country planning shows, and Prof. and Mrs. J. R. Hicks' recent study, for the National Institute of Economic and Social Research, of the problem of valuation for rating indicates that the whole system may well break down for financial reasons.

None the less, the conception of such schemes as the plan advanced for Plymouth, with its striking evidence of the vision of at least some local authorities, should not lead us to forget the danger that such breadth of vision and national outlook may not be characteristic or universal. Furthermore, as the debates on the control of land use in the House of Lords and on the Town and Country Planning Bill in the House of Commons have shown, progressive local authorities may not be in a position to implement their own plans. It was made clear when the Plymouth Plan was first published that support on a national scale would be essential if some of its proposals were to take effect: it must be part and parcel of a national plan.

The position of Plymouth was described in the House of Lords by Viscount Astor, who pointed out that to carry out the Abercrombie–Watson plan meant that the future population of Plymouth would be limited to a maximum of 180,000 as compared with 220,000 before the War. It is impossible to expect a population thus reduced in size and with its rateable value further reduced as a result of war damage to bear the burden of such replanning; to preserve the values and population which are commonly described as 'overspill', Viscount Astor urged not merely financial help but also an amalgamation, so that people who earn their money in Plymouth but live outside continue to be citizens and that the values which move from Plymouth to the adjoining districts are preserved within the area as a whole. Lord Woolton, it is true, during the House of Lords debate, promised that some form of financial assistance would be made available for the acquisition by local authorities of approved open spaces where such acquisition would impose an undue financial burden on the authority, but this provision does not meet the situation created by 'overspill'.

Other cities and towns, such as Bristol, Cardiff, Dover, Great Yarmouth, Hull, Portsmouth and Sunderland, are in a similar plight, and their local authorities have appealed for legislative help by an amendment to the Town and Count y Planning Bill to enable them to replan these cities on modern principles. While the devastation of war has facilitated an immediate recasting of layouts, such cities have insufficient land to house their citizens if they plan according to modern ideas by including green belts and open spaces. To avoid serious loss and incurring heavy liabilities, they call for security now by an extension of their borough boundaries. They cannot afford the delay and uncertainty of another Bill for the general revision of local authority boundaries, which the Minister of Health hopes to introduce in a later session.

The amendment which was requested is of more than local interest. By it, if the Minister, on representations by a borough in which there has been specially heavy and widespread damage due to enemy action, was satisfied that the carrying out of an adequate planning scheme would be delayed or frustrated because the scheme would lead to a serious loss of population, he would be empowered to initiate an inquiry. The tribunal set up, after taking evidence from all interests likely to be affected, would have power to recommend an extension of the borough's area. With such an amendment the 'blitzed' cities would be able to go ahead and to act as planning laboratories for the whole country, providing an invaluable practical test of bold, up-to-date planning. To this amendment Lord Justice Scott has lent powerful support, pointing out that it averts the imminent danger of the country losing a splendid opportunity of putting into practice the Scott Report and the Barlow Report. The debate on this amendment showed clearly the difficulties involved in dealing with this particular

situation separately from the general question of local government boundaries and areas. Support for the amendment was not unanimous, although the urgency of the situation was generally admitted, and Mr. W. S. Morrison gave a convincing reply in indicating his inability to accept the amendment. The danger of prejudicing a settlement on broad and permanent lines of a wider question which is already under consideration by the Government is clearly great, and much of the force of the argument in favour of the amendment was withdrawn when it was announced by Mr. Morrison and by the Minister of Health that a White Paper on Local Government would be laid before Parliament before Christmas and that legislation would follow in the next session. The amendment was withdrawn; but the situation is a severe defeat for the Government's attempt at piecemeal measures and forces it back to first principles, by which alone the dilemma of the 'blitzed' cities can be resolved.

It cannot, of course, be maintained that the Bill and the White Paper are not very incomplete. The Bill deals with the particular problem of the acquisition of land in large blocks by local authorities for the purpose of planning the redevelopment of areas as units. The White Paper deals with the more general problem of seeing that the use made of land by its owners is not contrary to the interests of the community, that values created by the community are recovered for the community, and, conversely, that property acquired in good faith is not arbitrarily or discriminately confiscated by the actions of the State. In the atmosphere of prejudice created against the Bill, something less than justice was done both to it and to the White Paper, and their reception cannot but arouse misgivings as to whether the problems of reconstruction will be tackled in a scientific manner and with knowledge and realism. At least, with the qualification already noted, the Bill gives the local authorities the essential minimum of what they require and, freeing them from their paralysing uncertainty, enables them to proceed with their plans, even if in circumstances not quite so favourable as they had hoped.

Again, the White Paper, while lacking the simplicity of outright nationalization, differs from the Uthwatt proposals in several respects, but on the whole, the new proposals seem to be more clear cut and for that reason to be preferred. With the Bill, the White Paper represents the first major advance into a region that has been much discussed but little explored, and the Government's plan has the major merit of treating both urban and rural land on the same footing. Moreover, the decision to transfer responsibility for paying compensation and collecting betterment to a national land commission relieves local authorities of the need to permit as much development as they prohibit within their own areas, regardless of the dictates of good planning. The proposals do not foreshadow the appearance of that national plan which has also been promised, and the need of which has been emphasized by the inquiries at Lincoln and Durham as well as in the debates. In fact, the power given by the Bill to a few local authorities to start the positive planning of the use of land in their cities increases the urgency of the need for a national framework within which such local efforts can find their place.

Moreover, the matter becomes more urgent as the problem of employment is faced. The latest report of the National Trust* indicates the tendency. The most recent additions bring the area owned by the Trust up to 100,000 acres, with another 39,000 areas controlled, but the increase is less than in recent years and the rate of increase is likely to diminish in future. This is a probable consequence of comprehensive control by the State of the use of land, and the Trust will clearly require to give careful consideration in such circumstances before accepting large tracts of land, especially when situated in the neighbourhood of densely populated areas with potential demands for residential or industrial development. Again, if national parks are to be set up under the control of a statutory body of commissioners, the work of the Trust in those particular regions may diminish in importance.

What is clear from this report is that if the importance of the National Trust in saving land, such as beauty spots, for the nation is decreasing, its importance as a land user is increasing. With the large area now under its administration, the National Trust is concerned with estate management, farming and forestry on the grand scale. It has to see that preservation does not mean sterilizing our scenic heritage. Its policy, as in national parks, must be to combine the maintenance of the countryside at its best as a historic legacy, a place of recreation and a source of food, timber and minerals.

The combination of the highest efficiency in farming and forestry with the greatest measure of public access and with the fostering of bird, insect and plant life is no simple problem, and for the Trust is enhanced by the low fertility of much of its property. The report emphasizes the exceptionally experienced administration and control that are required. Yet another problem is that of the use to which many of the larger houses acquired by the Trust could be put, and difficulties in the way of adapting them either to institutional use or for recreation while preserving their character unimpaired.

This tendency, noted in the report of the National Trust, is even more marked when we come to consider the questions of industrial development and the re-location of industry. The replanning and rebuilding of our war-damaged towns and cities, like the planning of the countryside of Britain and the housing problem generally, as was well shown in the recent *Planning* broadsheet, "Location of Employment", is linked up with the question of employment. The houses must be built where the men and women who are to live in them will find their employment. Hence the importance of those proposals for the development of the north east of England advanced by the Northern Industrial Group, and of Lieut.-Colonel W. C. Devereux's proposals for the industrial reconstruction

* National Trust for Places of Historic Interest or Natural Beauty. Report of the Council for the Years 1943–1944. Pp. 62+8 plates. (London: National Trust.)

of South Wales, and more recently for the industrial development of West Cumberland.

What is significant here, however, is the consciousness in these plans in the *Planning* broadsheet and in the debates in the House of Commons on the Town and Country Planning Bill, that not merely is a better balance of industry and labour required, as is declared in the Government's White Paper on Employment Policy, but also the development of real communities.

This is the essential point brought out in a report of the Social and Industrial Commission of the Church Assembly, "The Church and the Planning of Britain"*. Emphasizing that physical planning alone is not sufficient and that industrial mobility has an inherent threat to domestic life and the stability of urban life, with consequent social disintegration for which no degree of physical planning, however wisely directed, can compensate, it directs attention to a problem which has frequently been overlooked. As the report notes, the liability of employees of banks and certain types of firms, especially those who have reached managerial positions, to be moved from one place to another, while frequently unavoidable, is adverse to the development of civic and religious responsibility and stability. Moreover, to the extent to which the incidence of such mobility is heaviest on those who have proved their capacity for responsibility and leadership, it tends to deprive the local community of those who would be its natural leaders.

If it is true that greater mobility must be part of the price we have to pay for social security and full employment, as Mrs. Gertrude Williams has suggested, it is important that every effort should be made to minimize any ill consequences. The Church Assembly report points to five ways in which the present housing situation and social and economic background fail to satisfy the basic psychological needs of men and women: the limitations imposed on family needs by its restriction of domestic space; the lack of connexion with man's vocational life; the encroachment upon leisure and the imposition of 'rush-hour' conditions involved in its remoteness from the scene of work; its false isolation and lack of facilities for a natural communal life; and the cramped character of the environment its creates, which denies opportunities for withdrawal.

From this point of view, the report concurs with Mr. Lewis Mumford's view that good planning in the post-war period will rest on the solid foundation of the family, and the region; it will emphasize the biological and social needs of the people, and treat industrial and financial needs as subordinate. Quoting the Barlow Commission's conclusion that the disadvantages in many, if not most, of the great industrial concentrations alike on the social, the strategic and the economic sides constitute serious handicaps, and even in some respects dangers, to the nation's life and development, the report urges that more important than the size or area of a town or conurbation is the expression of size as a function of the social relations to be served. Proper planning and adequate spacing must be demanded in old towns and in new units, and apart from amenities the report urges that those migrating from congested towns must be welcomed into real communities with social life, established or in contemplation, and with proper provision of churches and chapels, schools and playgrounds, halls and social meeting centres and theatres.

The insistence in this report that dispersal or decentralization must be based on the principle of the living community, with adequate facilities not only for housing but also for living, working, and recreation—a community in which local life is developed and generous provision made for the moral and spiritual needs of the population—is a welcome reminder that the problem of the right use of land is linked up with the central problem of democracy, namely, that of securing the framework within which its essential spirit can have the fullest possible play. It is the problem of morale which confronts us here, that of securing a better balance between industry and agriculture, between public control and private enterprise, and the fuller integration of industry with the needs of the community. Already the debates on the Town and Country Planning Bill have demonstrated the need for effective machinery for adjustment, and the complexities of modern life make the problem increasingly difficult and important. Whatever solution may be found to the immediate problems of the control of the use of land before reconstruction can proceed, there will be no final solution until we have solved this wider and deeper problem of developing the organization or mechanism by which a living community can adjust itself continuously to its changing conditions, retaining both firm control over its environment and at the same time the freedom which the human spirit requires for its intellectual, moral and spiritual development. The proper way of planning things, as the Church Assembly report notes and experience has shown, is to secure the kind of structure which ensures that individuals and small groups in co-operation shall learn to control the material and the administrative adjustments of their own immediate surroundings, and so gain larger insights into, and control over, the wider world of affairs. If we are to save freedom we must proceed, as the late Archbishop of Canterbury has reminded us, from democracy of the individual to democracy of the person, and recollect that personality achieves itself in the lesser groupings within the State—in the family, the school, the guild, the trade union, the village, the city, the county. No physical planning will serve the needs of the post-war world which does not provide for the fostering of these and like loyalties, which have sprung up in civil defence and other activities under the stress and demands of war.

Such objects of loyalty can and do contribute to the wealth of tradition and inheritance of the State and thereby to its stability. Already the storm over the compensation clauses in the debate on the Town and Country Planning Bill has shown that, unless such loyalties are subordinated to, or rather integrated into, a higher loyalty, there can be no hope of solutions to problems so essential in the national interest. As

* The Church and the Planning of Britain. Report of the Social and Industrial Commission of the Church Assembly, 1944. (C.A. 753.) Pp. 32. (London: Church Assembly.) 2s.

the Prime Minister rightly said, for all its shortcomings the Bill is needed, for without it planning and reconstruction cannot proceed. The appeal to national unity and to a spirit of reasonable compromise will, it is to be hoped, be heeded. That such an appeal should have been necessary at this late hour is an unmistakable warning of the urgency of much greater attention to this question of public morale, and the fuller integration of group interests and loyalties with the larger and wider interests of the community. Important as may be the service which science can render in different ways to the planning of the use of the land and other material resources, it might make an even more significant contribution to the vast field of post-war reconstruction by an adequate attack on the problems encountered in the field of public relations—what Lord Stamp described as the science of social adjustment.

THE STORY OF ANATOMICAL EXPLORATION

A History of Comparative Anatomy

From Aristotle to the Eighteenth Century. By Prof. F. J. Cole. Pp. viii+524. (London: Macmillan and Co., Ltd., 1944.) 30*s*. net.

INTEREST in the structure of animals must have occupied the mind of man from remote antiquity, ever since they were the object of the chase and required to be prepared for food. Even palæolithic man indicated the surface anatomy of vital organs in his mural paintings of animals, and occasionally exercised his artistic propensities in making exquisite carvings of the flayed heads of horses, depicting the muscles with remarkable precision. From time immemorial, also, primitive communities have shown the liveliest interest in the individual variations of the visceral anatomy of domestic animals, using these variations as omens on which to base decisions of policy. But the study of comparative anatomy, which is essentially the search for common denominators in organic structure, is a scientific method, and could only be the product of philosophic inquiry into the meaning of life and living things.

It is with the history of this approach to biological problems that Prof. Cole deals in his brilliant treatise on the development of anatomical practice and thought from the time of Aristotle up to the eighteenth century. It is true to say that many biologists have been impatiently waiting for this book. Prof. Cole's erudition and scholarship as a historian of biological science are well known, and there is no doubt that in his particular field of study he stands pre-eminent to-day. In his preface the author informs the reader that he had originally intended to write an exhaustive history of zoological discovery, based on protracted and laborious searches carried on during many years. Considerations of brevity imposed by present-day circumstances, however, compelled him to put aside for the present this project, and he has contented himself with a more limited objective. But if the objective was necessarily limited, the result is highly impressive.

To the comparative anatomist whose acquaintance with the historical development of his subject is not so intimate as he might wish, a glance through Cole's book will cause surprise at the wide field covered by the old comparative anatomists (particularly of the sixteenth and seventeenth centuries), at their meticulously detailed descriptions, at the artistry and accuracy of their illustrations, and at their technical skill. A closer reading leads one to ponder on the motives and incentives which led to the development of this science, and suggests a continuous repercussion of two main driving interests. One of these is the ever-present urge in the human mind to reduce order out of chaos, to classify, and to search for a common plan underlying a profusion of variety. So arose the systematists who, beginning with Aristotle, gradually worked up to the impelling conception of the *Echelle des êtres*, which dominated the minds of zoologists in the immediately pre-Darwinian era. Belon, Rondelet, Aldrovandus, Coiter, Gesner and others represented this field in the sixteenth century. Belon's work is noted for his study of homologies in the human and avian skeletons, and he may perhaps be regarded as the initiator of the science of pure morphology. Coiter's magnificent publications on comparative osteology arouse admiration largely because of the superb illustrations executed by himself. His figure of the articulated skeleton of a capuchin monkey, for accuracy of delineation and effectiveness of technique, would be regarded as excellent in any anatomical monograph of to-day. Incidentally, it might be interesting to investigate the correlation between anatomical achievement and artistic ability, for both require an aptitude for visualization of an unusual kind. It seems not improbable that some of the anatomical books which appear in modern times really owe their origin to the pleasure which the authors obviously experience in illustrating them.

Despite the care and thoroughness with which medieval systematists conducted their studies, it is remarkable that they were often unable to break away from purely popular conceptions of classification. For example, the porpoise seems to have occupied the puzzled attention of several comparative anatomists—Belon in 1551, Ray in 1671 and Tyson in 1680. Yet, in spite of the evidence of their eyes, they continued to classify it with the fishes. But it is evident that this conservative view was accepted with some reluctance. Tyson remarks that when we view the porpoise externally there is nothing more like a fish, but when we look within there is nothing less like one. He even says he would *like* to think it is not a fish, but this is as far as he is prepared to go in the face of popular assumption. Although Tyson's anatomical studies covered a wide field of vertebrates and invertebrates (among other things he gives the first anatomical description of a marsupial), he is perhaps best known for his study of the chimpanzee, a noteworthy contribution to the study of systematics, for it brought man himself into much more direct relation with lower mammals. The chimpanzee, he concludes, is "no *Man*, nor yet the *Common Ape*; but a sort of *Animal* between both".

Comparative anatomical exploration during the latter half of the seventeenth and the first half of the eighteenth centuries was very prolific, but was pursued with little attempt at the formulation of general principles of morphology; so that, as Cole points out, Vicq D'Azyr in 1786 was concerned to direct attention to the masses of undigested and incongruous facts which had been assembled and to complain that they tended to produce a feeling of fatigue and weariness in the reader. Yet it was this

field of study which led to the development of the transcendental philosophy of anatomy in the early part of the nineteenth century, a philosophy which, although sterile in itself, was almost a necessary precursor of the evolutionary conceptions which rapidly followed. At the same time, it is a remarkable fact that, as E. S. Russell points out in his book "Form and Function", when the evolutionary conception was at last raised to the level of a scientific hypothesis, it was from pure morphologists such as Cuvier and von Baer that the most violent opposition arose.

We have noted that one of the incentives which initiated the study of comparative anatomy was the innate tendency of the human mind to systematize and classify. The other powerful incentive arose from the development of medical science. It is easy to understand that, in the period when the difficulties in the way of dissecting human corpses were immense, zootomy became a common practice as an indirect method of approach to the study of human anatomy. Indeed, as is well known, some of the early descriptions of human anatomists were vitiated by the fact that conditions peculiar to lower animals were sometimes reported as normal for man. Even Galen and Vesalius bear some responsibility for such errors. But, apart altogether from considerations of practical necessity, many human anatomists of the sixteenth and seventeenth centuries deliberately studied animal structure in the belief that their simpler organization might provide an opportunity for determining functions which are obscured by too great a complexity in man. This, of course, is one of the essential aims of comparative anatomy and was the view of Casserius in 1601 when he expressly claimed that the fabric of man could be explained by reference to lower animals, and of Samuel Collins, physician to Charles II, who wrote in 1685, "I humbly conceive the great use of comparative anatomy is to illustrate the structure, actions and uses of the human body".

The idea was grandly conceived, but the records of comparative anatomy up to the present time have disclosed the limitations of such a method. Even Malpighi was constrained to confess in the introduction to his "Anatome plantarum" (in 1675) that he had been disappointed in its results. But the study of comparative anatomy with reference to human structure and functions was fully vindicated by the realization that lower animals could be made the subject of experimental investigation, and for this purpose the establishment of homologies and analogies in the structure of different species became a most essential preliminary. The significance of comparative anatomy for the experimentalist was evidently realized by a number of early anatomists, starting with Galen. But it was Harvey who first developed this method of approach in the study of human functions, though, as Cole emphasizes, to him the lower animals were also worth studying for their own sake and for the light they throw on the fundamental truths of biological science. It is possible that even to-day the limitations of pure comparative anatomy as a method of elucidating function are not always fully recognized. It is a method of the utmost value as a preliminary survey for experimental investigation, and it can often offer important clues and hints to the physiologist, but it may be doubted whether comparative anatomy *by itself* has ever been able to supply the final proof of the function of any structure the significance of which is in any way obscure.

In the concluding part of his book Prof. Cole discusses the value of a knowledge of the history of scientific learning to the modern man of science and rightly urges that more attention should be given to it in the educational curriculum. Among other things, it helps to develop that sense of humility which is surely a desirable attribute for the research worker who aims at high achievement. But we would demur from Prof. Cole's suggestion that "future generations will view with amusement the involved jargon and mechanical elaboration which condemn the chromosome theory of heredity and remind us of the evanescent frenzy of the nineteenth-century transcendentalists". After all, the modern geneticist can claim that his conclusions are based, not on superficial analogies and philosophical abstractions, but on a solid abundance of carefully controlled experimental work.

Prof. Cole's book is without doubt one of the great works on the history of biological science. It is the product of mature thought and many years of bibliographical research, and the fact that the author himself is a professional biologist gives it additional value. In spite of war-time restrictions on the quality of paper available for a production such as this, it is extensively adorned with excellently reproduced illustrations. It is to be hoped that Prof. Cole's original intention to write a much more comprehensive work on zoological discovery will find its realization before long.

W. E. LE G. CLARK.

PROBING THE METABOLIC SECRETS OF THE TISSUES

Creatine and Creatinine Metabolism

By Prof. Howard H. Beard. Pp. x+376. (London: Chapman and Hall, Ltd., 1943.) 24*s*. net.

SINCE Prof. A. Hunter published his monograph on "Creatine and Creatinine" in 1926, much experimental evidence has accumulated. At intervals since then there have been reviews but probably none so full as the present monograph by Prof. Beard. His contribution represents a fresh approach to the problems of creatine and creatinine metabolism.

Creatine is the chief nitrogenous constituent of muscle tissue, and the author submits reactions to illustrate the synthesis of creatine and creatinine *in vivo* and *in vitro*. Despite the fact that glycocyamine has long been recognized to be methylated to creatine in the animal body, its role as a creatine precursor has not apparently been accepted until recently.

It is held that the mechanism for creatine synthesis from urea and glycine resides in the muscles, while that of arginine and glycine resides in the kidney, and that methylation takes place in the liver. The muscles, liver and kidneys are apparently the tissues chiefly concerned with the formation of creatine and creatinine from most of the amino-acids of the diet. It is also certain that creatine can arise from creatinine *in situ* in the body and also in *in vitro* studies.

The author considers that from data secured in 1925 he was able to obtain probably the first definite evidence against the distinction between exogenous and endogenous metabolism. The recent brilliant work of Schoenheimer *et al.* in this field has shown that the newly formed creatine (and creatinine) molecules acquire their parts from the food as well

as from tissue components, for example, the amino-acids, arginine and glycine. This is taken as further evidence against the concept of two independent (exogenous and endogenous) types of catabolism. H. H. Mitchell, on the other hand, appears to hold that tissue creatine is very constantly undergoing dehydration to creatinine (which is eliminated by the body as a useless metabolite); that it is being constantly formed, and that the rate of its synthesis cannot be readily accelerated by an over-abundance of its precursors in the tissues, nor by the administration of amino-acids. The author, however, considers that creatine and creatinine represent uniform rather than constant metabolites, and their formation and excretion are governed by the rate of protein metabolism, and that Mitchell has not really offered evidence to refute Schoenheimer's views.

There is at present a considerable difference of opinion as to whether the feeding of gelatin (with its high content of glycine), or glycine itself, will increase the energy output in man. In Prof. Beard's experience only 75 per cent of a given number of individuals will show increases in energy output, with the other 25 per cent exhibiting nothing after glycine or glycine-urea ingestion. This he considers to be a normal physiological variation between individuals and should be recognized as such. It is held by the author that glycine will not form creatine unless a normal or high protein diet is fed at the same time, as otherwise the glycine or the amino-acids hydrolysed from gelatin will go first to meet this demand. Although the author believes in the beneficial action of glycine the case for glycine is, on the balance of evidence, 'not proven'.

Much of what is described here is still highly controversial and is certain to stimulate much discussion. If a fault may be found it relates to the author's enthusiasm for the role of glycine in the treatment of varied clinical conditions. It is here that he will probably encounter most criticism; but although his account appears to have this bias it will most certainly have been of value if it stimulates further work.

D. P. CUTHBERTSON.

PLASTICS MADE EASY

Plastic Horizons

By B. H. Weil and Victor J. Anhorn. (Science for War and Peace Series.) Pp. ix+169. (Lancaster, Pa.: Jaques Cattell Press, 1944.) 2.50 dollars.

THIS little book is worth careful examination, for it may represent the kind of thing with which the public is fed or doped in the days to come. In the 'blurb' on the dust cover it claims to take up where the newspaper articles and institutional advertising leave off. It is a back-to-earth job in which curiosity and interest in plastics will be supplanted by actual working knowledge. To use the author's favourite expression it may, and then again it may not.

The book starts well from the conception that we can scarcely help noticing the world around us: countless changes begin to intrigue our fancy and stimulate our imagination. This is largely true of America, thanks to a Press which is more and more prepared to direct attention to the progress of science and to display attractive advertisements which make names and processes known to a public which is ready to accept anything new. It is far from true of Great Britain, where the masses are conservative. Proof of this is afforded by the reception given to the 'Portal House', which represents quite the finest step forward in domestic engineering of this century. The British Press has not yet learned to talk about science, its occasional efforts are too often characterized by exaggeration and inaccuracy, our advertising is poor. Scientific workers as a class do not want publicity, least of all that which is associated with a particular name, often the wrong one.

Assuming we have an interest, such as our forefathers did, in the things we use, what can we learn about plastics? The word is now an accepted one though it involves a contradiction, and we use it as descriptive of a large number of substances which the chemist makes of the most diverse properties—billiard balls, 'Nylon' stockings, telephones, glues and lacquers. I think we should encourage the definition that the chemist makes them from a few simple substances which he can procure quite inexpensively in quantities of thousands of tons, for it leads to the next question, How does he make so many different things from these few starting materials? The authors plunge us into structural chemistry and are not afraid to cover several pages with structural formulæ, which inspires a wholesome respect for it and the molecular engineers who follow its precepts. The phrase is a good one, for those who engage in synthetic chemistry are 'molecular engineers' building up from small molecules, with only two atoms of carbon, and thus comparable with bricks, a mighty structure composed of thousands of molecules. These molecular chains vary; when they are long and contain little interlinkage they can be worked and re-worked and are termed thermoplastic. But if there is much cross-linkage between the chains the first heating sets up a rigid molecular structure and the product is thermo-setting.

The authors get us thus far in fifteen pages, and it will be admitted that they have done a good job in getting the idea of molecular structure across. The book goes on in this fashion, telling us about moulding, about particular resins, how they are made and from what materials—our interest is continually stimulated. But people are most interested in uses, for war to-day and for peace purposes to-morrow, so we are told something about these. This section is rather superficial and too much a catalogue without indication of the why and wherefore of its use: the chapter is below the standard of the early part of the book. The authors have more scope when they come to synthetic fibres and synthetic rubber, two things about which the public really want to know; the chapter contains a lot of information and an indication of the competition to be faced.

The final subject, plastics and the future, is one which gives scope for the enthusiast; but the authors, while stimulating, are commendably restrained. Plastics will supplement rather than supplant the traditional structural materials, applications will multiply, prices will grow less, the versatility of the materials will find new uses for them, but we are not on the eve of a plastics age nor will their use solve all the problems of man.

I have written enough to show that I find this a readable book, written on a high level though essentially popular, and one which would help in the understanding of what the chemist is doing and can do if it could only reach a large section of the public. I think it fulfils the authors' aspirations.

E. F. ARMSTRONG.

ROBERT WIGHT (1796–1872), DR. FREKE AND THE "ORIGIN OF SPECIES"

By T. E. T. BOND

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AN interesting sidelight on the Darwinian controversies of the early 1860's is afforded by some fragments of contemporary correspondence which have recently come to my notice and which are worth placing on record as much for their subject as for their intrinsic merit of style. The documents accompanied some volumes of Robert Wight's Indian botanical works—the "Illustrations of Indian Botany" and autographed copies of the "Spicilegium Neilgherrense" and vol. 6 of the "Icones Plantarum . . ."—generously loaned to the library of this Institute by his great-grandson, Mr. H. C. Cosens, who is a Ceylon tea planter. They consist of four draft letters in Wight's handwriting addressed to Dr. Freke, of Dublin, on the subject of two pamphlets by the latter author which are also preserved with the letters. Freke is largely concerned with establishing the priority of his own views over others which he attributes to Darwin; Wight, in his letters, has some trenchant observations of his own to make as to the relative merits of the conclusions reached by these two authors. I have no means at present of finding out whether the final version of the letter was ever sent or, if sent, whether it is still in existence; nor have I the opportunity of following up many of the points of historical and biographical interest which are raised by this material. In this article I shall not attempt to do more than briefly introduce the two characters concerned and thereafter, so far as possible, allow the papers to speak for themselves.

Robert Wight left India in 1853, so that all his botanical works while in that country might be expected to have a 'pre-Darwinian' flavour. As anyone who is in the least acquainted with them will know, they are indelibly stamped with his own forceful and vigorous personality in addition. The blending of the age and the man is seen nowhere to better advantage than in his preface to the "Spicilegium Neilgherrense", written, presumably, in 1846. A follower, for practical purposes, of the de Candollean modifications of Jussieu's system, he here enlarges on the desirability of attaining to a still closer approximation of "the true Natural System of Botanical classification, now so ardently sought for by all philosophical Botanists". He is indeed well aware of the difficulties in the way, not the least of which is that, as he says, ". . . even the most learned and philosophical among them, seem not to know quite clearly what they are in search of and of course can scarcely be expected to inform others what they do not well understand themselves".

Having disposed of the argument that the natural system "is neither more nor less than a human contrivance", and demonstrated that there can only be one such, namely, that which repeats the design of the Creator, he proceeds to show that the "*Circular* method" affords the best clue to its discovery. The system that is favoured presupposes a ternary, or rather quinary, subdivision of the animal and vegetable kingdoms by analogy with the three primary circles of affinity, namely, "Animals being the typical circle, Vegetables the sub-Typical and Inanimate matter the Aberrant; which last is made up of three minor ones the endless modifications of Earth, Water and Air; each equally perfect, thus making together a series of five". All is well so far as the first stage in the subdivision whereby, for example, the exogens (or dicotyledons) are revealed as analogous with the vertebrates. Afterwards, however, "the Zoological system . . . seems to have gone far ahead of the Botanical" and even in the latest systems of Lindley and of Endlicher, which are briefly noted, no satisfactory quinary subdivision is attained for the primary exogenous and endogenous groups. To make good this deficiency, Wight then sketches out a provisional quinary classification of his own, using many of the Lindley and Endlicher class names. His groups, he says, "have a circular appearance and give promise that . . . their thorough investigation may put us on the right path and speedily enable us to reach the long and anxiously sought for goal". For Wight, "to discover these [circles], if they actually exist in Nature, appears in the present state of enquiry to be the first and grand desideratum towards the discovery of the true Natural System of plants".

While Wight was speculating on the logical advantages of the one true natural system of classification as revealing the orderly plan of the Creator, Freke was developing a system whereby the actual process of creation could have been effected. His ideas in the main appear to have been derived from Bichat (1771–1802), who postulated "that the life of the body is the outcome of the combined lives of the constituent tissues" (Sir William Dampier, "A History of Science", 3rd edn., p. 274). For these tissues, Freke infers an ultimate common origin in a primordial form, the "embryo of organic creation". He thus claims to be the original propounder of the doctrine of descent and stoutly maintains that it is he, and not Darwin, to whom credit for this doctrine should be given. In a short paragraph devoted to Freke in the historical introduction to the revised edition of the "Origin of Species", Darwin refers (p. 19) to "the difficult attempt to give any idea of his views"; indeed, not without reason, as will be demonstrated in the ensuing paragraphs.

Freke's earlier pamphlet is evidently a reprint of the circular mentioned by Darwin (*loc. cit.*), which was published originally in October 1860. It consists largely of quotations from the author's articles in the *Dublin Medical Press* of the years 1851–52, and in its present edition takes the form of a prospectus for his book "On the Origin of Species by Means of Organic Affinity", newly published in 1861. The title is an obvious counter to Darwin's work to which, he says, surely with studied under-emphasis, "My attention has, within the last few days, been directed by the merest accident . . .—a work, which as I have been given to understand, is at the present moment attracting a large share of public attention". His position is soon defined; following the review (presumably Bishop Wilberforce's) in the *Quarterly*, and with entire neglect of the principle of natural selection and the arguments upon which it is based, he quotes Darwin's statement that "Analogy would lead to the belief that all animals and plants have descended from some one prototype" as the sole point at issue. He "feel[s] it to be due, as well to myself as to science, to acquaint the physiological public that although that theory has now been reached through a different channel, it has not *now* been announced for the first time. *Nine years* before the appearance of Mr. Darwin's publication, I, as the

result exclusively of *inductive* inquiry, submitted this *identical hypothesis* to the judgment of physiologists —a conclusion which Mr. Darwin has since attained to by *analogy*".

The original announcement of the theory is supported by the first of the quotations from the *Dublin Medical Press* of November 1851. In this, Freke presents as an important subject of physiological inquiry the distinction between the organic world "*at the period of its creation*" and at "its present *advanced stage of development*". The second paragraph of the quotation is worth reproducing in full, with Freke's italics and parentheses :

"The line of investigation which (as it appears to me) should be pursued in such inquiry is the following—namely, I should endeavour to ascertain,—first, what is the constitution of organic creation as it *now* exists ; or in other words, what is the constitution of the *present generation* of organised being ? and secondly, how or *in what manner* has the present generation been *generated* or formed by the preceding generation ? A knowledge of these two facts would (as I conceive) furnish us with data from which to collect a certain amount of information as regards the *necessary* constitution of the *origin* or (if I may venture to term it) of the *embryo of all generations*. For if the manner in which organised beings universally have been generated can be *accurately* traced back for *one* generation, there is nothing to prevent its being, with equal accuracy, traced back for *many* ; and *the possibility* is that it may, with a certain degree of accuracy, be traced back *for all* generations ; that is, in other words, till we have eventually arrived, in imagination, at (if I may so term it) the *embryo* of ALL organic creation".

Pursuing this inductive inquiry on the assumption that all individual living beings "*have been formed by the union of a number of minute organisms*", or "organizing atoms", he reaches the conclusion (at first sight almost a foreshadowing of the discovery of the linear arrangement of genes in the chromosome) that the "embryo of organic creation" consisted of "a chain composed of perhaps but a few individual microscopic granules".

Later in the same article, the nature of this chain of organizing atoms is further defined. Each atom is to be regarded as a "*distinct species of organizing matter*", with the common function, however, of indefinite self-regeneration through the process of imparting ever higher degrees of organization to the "organized residual products" of the atom beneath it in the chain, the lowest atom of all having as its substratum of activity "the unorganized or mineral world". The various "organizing atoms", by uniting in various ways, were supposed to constitute the "*first or earliest embryos*" of different plant and animal species, their "organized residual products" similarly combining to form "the various compound residual products required by Nature to enable those embryos to discharge their physiological function". "This, I say, appears to me to have been the origin of species by means of what I have ventured to term *organic affinity*". Freke is no believer in evolution in the Darwinian sense : he is concerned merely with the formation of "*the first generation* of living beings", not with any possibility of their subsequent modification by descent. Indeed, he is at pains to emphasize, beneath the title of his book, that "Nothing is advanced in this publication that is not perfectly in harmony with the Mosaic record of Creation".

So far, it is not difficult for the modern reader to find in Freke's "organizing atoms" and their products an analogy with his own concepts of genes, organization centres, etc. ; but the author soon makes it clear that he has in mind categories of much more limited anatomical significance only. This is developed in the postscript to the above quotations and especially in the second of the two pamphlets, which is dated October 1862.

The heading of the second pamphlet (considerably shortened) runs :

"TABULAR VIEW of the relation . . . between the Three Kingdoms of Nature with regard to Organization ; including that subsisting between Organizing Agents and Organized Residual Products . . ., shewing at the same time the Circle of the same elementary components . . . ; and pointing to the nature of the *dependency* of LIFE upon DEATH in both the Vegetable and the Animal Kingdom".

The pamphlet chiefly adds the names of the "organizing atoms"—*lignat, musculat, celebrat*, etc., with, rather surprisingly, *georgat* as the first of the vegetable series—"the simple germ (or atom) which organizes earth". Finally, the dependence of life upon death is illustrated by considering the difference between the plant and animal worlds, the "*organic life*" of plants involving merely the death (and simultaneous regeneration) of *organizing agents*, the higher form of "animal life" involving in addition a second species of death, namely the death of the *organized residual products*. As evidence of this, the indefinite increase in size of the plant body is contrasted with the fixed size of the animal. The views expressed in this second pamphlet are traced in part to an essay published in 1848 ("Freke on Organization"), in part to the article, already referred to, in the *Dublin Medical Press* of 1852.

Reading Freke's pamphlets, one cannot help but admire his apparent ingenuity and fertility of imagination, even while exasperated and amused in turn by the redundancy of his style. It is not for me to assess the originality of his ideas ; but at least it is surprising to find him omitted from the "Dictionary of National Biography". Here, only "John Freke (1688–1756), surgeon" and "William Freke (1662–1744), mystical writer", find a place ; and either, one feels, would have been an appropriate forbear.

That Robert Wight, no less than Darwin, found it difficult to deal with Freke's views is apparent from his manuscripts, which can now be described. The letters were written in Wight's retirement, presumably from Grazely Lodge, Berkshire, and from the internal evidence they can be dated to within the first fortnight or so of December 1862. Three out of the four can fairly easily be arranged in order : the first (about three hundred words, in pencil on the back of a seedsman's circular) is apparently a rough draft for the second (about 550 words) which, in turn, was expanded into the third (about a thousand words), written a week later. Of these, I propose to give extracts, making, so far as possible, a continuous narrative, the references in brackets (1–3) indicating the source of the material as described above. The fourth, which is unfortunately a fragment only (about three hundred words, on a half sheet of paper, apparently with a preceding portion torn away) is less easy to place ; being in addition rather lighter and more personal in style as compared with the others, it may be quoted, almost in its entirety, as a fitting tailpiece to the series.

In the opening paragraph of (2) and (3) there is a reference to some earlier criticisms made by Wight, apparently well received. These perhaps related to the pamphlet(s), Wight being presented afterwards with copies of the author's books, as mentioned in the letter :

"My Dear Sir,

"I am ashamed to have to begin my letter with the confession that at least 10 days have elapsed since I had the pleasure of receiving your letter of the 22nd and the books which arrived the day after. I accept them with many [thanks] and hope we shall some future day have the pleasure of becoming better acquainted. I was exceedingly pleased to learn that my criticisms were so well received for, to tell you the honest truth, I was very fearful, when I read over for the last time what I had written, that on some points I had been much too severe and thought of either suppressing my letter altogether rather than hurt your feelings further after the strain to which they had already been put, or write the whole over. The latter alternative was out of the question so I determined to send it on, hoping for the best. Since happily you think the criticism was not really unjust and was written in a really friendly spirit let us bury the objectionable parts in the saying that ' 'tis all well that ends well'.

"Since the receipt of your volumes I have been reflecting a good deal on your and Mr. Darwin's views on the origin of species and right or wrong have arrived at a conclusion somewhat different from both. You say you have arrived at a conclusion 'as the result exclusively of *inductive* enquiry' which Mr. Darwin has since attained to by *Analogy*. In this statement I think you have fallen into an error. To my mind, induction is the process employed in both cases, with this difference, that the inductive process begins at opposite ends. He reasons backwards from the perfect plant and animal to the primordial germ, whereas you reason from the assumed germ onwards to the perfect animal. He says 'I cannot doubt that the theory of descent with modification embraces all the members of the same class. I believe that animals have descended from at most four or five progenitors and plants from an equal or lesser number'. That is the theory arrived at by induction. He then adds that analogy would lead one one step further, namely to the belief that all animals and plants have descended from one prototype: and adds that analogy may be a 'deceitful guide'* ; and then winds up by saying that he would infer from analogy that probably all organic beings that ever lived have descended from one primordial form *into which LIFE was breathed by the Creator*. His theory, then, rests on a persevering close induction carried on through 480 pages; the finale only is an Analogical inference. And that inference I think questionable.

"You, on the other hand, assume that the Creator imparted life to a germ which then went on multiplying itself and your induction, resting on that assumption, goes to show that such must be the case. The induction therefore, every step of which may be unquestionable, rests on a postulate which you can't prove. Darwin's, on the other hand, rests in the first instance on unquestionable facts, the known tendency of both plants and animals to form variations" (3).

Although the logic of Darwin's argument is thus favourably contrasted with Freke's, his conclusions are not thereby rendered acceptable. This is well brought out by reference to an earlier version, namely:

"Darwin being a laborious painstaking man and a deep very cautious thinker started on his course of investigation, which for twenty years he has never ceased to follow up, from certain undeniable data of every day occurrence among both Animals and Vegetables, their liability namely under certain circumstances to variation. Then, calling in the aid and experience of the breeder and gardener and allowing unlimited time he has as he supposes traced back organization to a point or at most a few points or monads or primordial germs or any other name you may prefer but still admits that these germ or germs must in the first instance have derived its vitality from a higher [? source]. Working on that idea for 20 or more years he has ransacked every source of information which he can directly or indirectly bring to bear on the subject and has made a very interesting book, heavy at times to read from his peculiar style, but to my mind lost labour for it leads to nothing, does not advance our knowledge of the origin of vitality and only claims for it powers which all our experience goes to disprove. . . ." (1).

A big stumbling-block is the apparent fixity of living species and the difficulty of envisaging modifications of the size demanded by the evolution theory. As Darwin puts it . . . "we are always slow in admitting great changes of which we do not see the steps".

"A grain of pollen the 100,000th part of an inch in diameter is placed in contact with the pistil of its own species and a great tree results; but apply the pollen of an Oak to the Alder or Pine or any other genus but its own and it fails to impregnate the ovum. This law holds throughout the whole vegetable kingdom . . .

"From this I infer that the Deity in creating organic germs, supposing that was his mode of proceeding, imparted to each its specific character, which, with some modification, it still retains; by which it is permitted to vary within certain limits. The Gardener produces floral varieties in any number but he can't change an apple into a pear nor a cherry into a plumb [*sic*]. The pigeon breeder can by selection and careful breeding obtain many varieties among the species of that genus but can't change a pigeon into a hawk, and won't the same law hold good through the whole of the organic kingdom? Specific variations are everywhere observable, but not transitions from one natural order or genus to another (2).

"It is difficult if not quite impossible with almost any stretch of the imagination, assisted even by myriads of years, to fancy such an unit as a Byssus becoming a lofty Palm, or a monocotyledonous grass an umbrageous oak" (3).

But the biggest difficulty of all, in accepting either theory, is the philosophical one: the element of chance is felt to play too great a part. Wight, as much as Freke, ignores completely the force of natural selection.

"Since reading Darwin's volume, I have thought much of his theory as summed up in the concluding page and with every wish to view it with a favourable eye I cannot bring [my] mind to accept it as a correct exposition of the Creator's plan in covering the earth [with] its organic inhabitants, vegetable and animal. We can in imagination conceive the deity imparting to certain atomic elements the force called life, enabling them to impart the same force to others of the same kind just as a spark falling among suitable materials will raise a great fire, but I cannot accept the idea that out of such materials—shapeless vitalized atoms—the wonderfully complex organisations each and all possessing the most perfect adaptation to its wants could ever have been derived without the aid and guidance [of] omnipotent power and inscrutable wisdom. From the first promulgation of the idea as deduced from Analogy my question has always been, what does Philosophy gain by its adoption? The aid of the Deity is required to set life in motion, why then limit his power to the mere giving of life, leaving it to circumstances to determine its forming a shapeless puffball or a man? (2).

". . . having required the aid of Omnipotence to organize our first atom it behoves us to return to the same source and solicit inscrutable wisdom to superadd those laws of combination and arrangement which we find prevailing throughout organic existence. . . . I go a step further and add that since the aid of the Deity is needed in the first instance to impart life and organisation, that organic philosophy gains nothing whatever—it may lose—by adopting the doctrine [of] the creation of a solitary primordial form—germ or atom, call it what you will—and leaving all the rest to secondary causes" (3).

To Wight then, 'organic philosophy' carried the day and the evolutionists were found wanting. The order and logic of the natural system with its quinary circles of affinity were perhaps more to his liking than

* A quotation conveniently omitted by Freke.

the ruthlessness of natural selection and the improbabilities of the "embryo of ALL organic creation". But at least the issue was not decided without much thought. Of all the four versions of the final verdict which have survived in these manuscripts, none is more characteristic than that which follows, in conclusion :

". . . But I now find that were I to attempt extending my notes on the subject they would form quite an essay . . ., while my imperfect acquaintance with the science of the present day would to some extent disqualify them for publication in the state they flowed from my pen. As mere suggestions to help a master mind they might perhaps be useful, but scarcely otherwise. But be that as it may, I am not by any means satisfied in my own mind that either of you have attained the desired goal though you attempt to reach it by such different routes. He [*i.e.* Darwin] starts from the present time and by a rigid process of induction argues that nature commenced her existing animal kingdom by the creation of some 4 or 5 forms, her vegetable one by about as many primary vegetable forms thousands of years ago. Such is the process by which the patient and laborious Saxon goes to work. The rapid thinking and impulsive Celt on the other hand, having caught sight of his theory in the distance, straightway bounds to prove by induction that it must be right. While the cautious Scotchman looks first at the one and then at the other and right or wrong thinks both have missed the mark and concludes that Moses is the profoundest Philosopher of the three since he is content to take things as he finds them and in one word declares all we know or are ever likely to know by saying *God Created*, without enquiring how".

STRUCTURE AND EVOLUTION OF THE LEVANT AND NORTHERN AFRICA

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THE following notes are an attempt to recapitulate the essential stages in the development of the southern side of the western Tethys and of the Mediterranean. They refer particularly to Leo Picard's publications, especially "Structure and Evolution of Palestine, with Comparative Notes on Neighbouring Countries"*, from the point of view of the geologist who has some familiarity with north African problems. Much that is still in doubt and much of local significance must inevitably be omitted ; nevertheless a broad review of this type may be useful at the present juncture.

At the end of the Pre-Cambrian, Palestine lay on the borders of a high (Upper Algonkian) mountain range in which earlier mountains and varied rock types were welded into a mountain mass : this may be traced from Arabia through Sinai and the Red Sea Hills into Africa ("Arabo-Nubian mass"). Pre-Palæozoic denudation reduced the mountains to a lowland with seas lying on the west and north, the latter being identified with an east-west Palæozoic sea. Marine Cambrian beds are recorded on the mainland mass of north-west Africa and of western Asia, and from the Cambrian to the Cenozoic there were far-reaching transgressions across Mauritania, the Sahara, Libya and Egypt into the interior of Africa, across Palestine into Arabia.

During regressive phases, widespread continental beds were laid down over areas formerly marine. As there was continuous subaerial denudation and accumulation over the land areas, stratigraphy there is concerned largely with the interdigitation of continuous and discontinuous subaerial deposits, lagoonal and marine beds. The shore-line, continually shifting, was frequently indented : the sea and its lagoons ran far into deep bays between promontories on which subaerial processes continued. The advances of the epicontinental seas might therefore be called, as Picard suggests, ingressions rather than transgressions. The major promontories were broadly related to swells or structural undulations, the locations of which in northern Africa are plainly marked.

The continental beds consist for the most part of dune-sands and fluviatile quartz conglomerates : similar beds are now accumulating in the continental interiors of Arabia and northern Africa. Nubian Sandstone is an unfortunate term for these beds, in my opinion ; Nubian facies expresses all that is desired : Nubia (in a broad sense) and lands to the south of it have probably been continental since the Pre-Cambrian.

Palæozoic transgressions (or ingressions) occurred in Palestine and adjoining territories in the Middle Cambrian, Ordovician, Silurian, Lower Devonian (?) and Lower Carboniferous (Sinai and on the Egyptian side of the Gulf of Suez) : the Silurian left graptolite-bearing shales in Central Arabia.

In northern Africa the Palæozoic transgressions, Cambrian, Ordovician, Silurian, Lower-Upper Devonian, Lower Carboniferous seem to have come from the west rather than the north. The Silurian graptolite-bearing shales can be traced far into the interior, where they pass into sandstones. In western Asia, as in northern Africa, the Carboniferous seems to have witnessed final Palæozoic regression. The Triassic palæography of Palestine was nevertheless related to that of the Palæozoic, with a shelf sea, transgressive from the nearly Tethys, in the Lower-Middle Trias, followed by Upper Triassic uplift and continental beds.

The north-western corner of the African shield, with its Palæozoic blankets, was involved in Hercynean mountain building, and Triassic (or Permo-Triassic) red beds with salt mark a stage in the ensuing denudation : except for small patches of lagoonal beds, the unfolded continental platform seems to be devoid of Triassic rocks.

In Sinai and Palestine there was renewed transgression of a Jurassic sea shallowing eastward : locally there are thick Bajocian – Kimmeridgian beds following a Lower Jurassic (Liassic) continental phase. Moreover, the uppermost Jurassic (Portlandian) beds appear to be regressive-continental, a condition which was maintained until Wealden (Lebanon – Palestine), Albian (Syria), or Cenomanian (Eastern Sinai–Transjordan) transgression supervened. The 'facies of the Nubian Sandstone' predominated during the regressive and transgressive phases ; there was extensive volcanic activity and probably fracture in the transition from the Jurassic to the Cretaceous.

There is a small exposure of marine Jurassic beds on the Egyptian side of the Gulf of Suez ; otherwise they do not seem to be exposed in Egypt, Libya or the Sahara : some continental beds are known in Libya, and probably there are others. A new element is discernible however, namely, the Mesozoic sea of

* Structure and Evolution of Palestine : with Comparative Notes on Neighbouring Countries. By Leo Picard. (Bulletin of the Geological Department, Vol. 4, Nos. 2, 3, 4.) Pp. iv+134. (Jerusalem : Geological Department, Hebrew University, 1943.)

Barbary, where thick Jurassic sediments, mostly limestones, followed the Trias: they represent sedimentation in a deepening sea which seems to have transgressed southward on to the platform of the Sahara only locally (Saharan Atlas, Tripolitanian coast). The Jurassic development of Barbary and of the northern Saharan fringe therefore differed from that of the Levant in certain particulars; in both there were ingressions accompanied by thick limestones, and between them continental north Africa was probably dry land.

Much uniformity is to be observed in Cretaceous development. Aptian – Albian transgression appears from north Sinai across Palestine to the Lebanon; southern Sinai and Transjordan were still continental, but the sea penetrated into them in the Upper Cretaceous, in part only in the Upper Cenomanian: it does not seem to have invaded the Arabian Central mass. The Upper Cretaceous dolomite is thick in Palestine, in western Transjordan the beds are thin and sublittoral; the Senonian – Maestrichtian being phosphatic and including abundant cherts. There was Upper Cretaceous vulcanicity in Transjordan.

In north Africa transgression was widespread from Egypt to the Atlantic, giving rise to shales, marls and limestones, and penetrating to the continental interior. In Egypt the Lower Cretaceous is slightly exposed only in the north, the Upper Cretaceous Cenomanian and Turonian transgressed farther to the south, and the Senonian – Maestrichtian includes the most southerly outcrops. Their littoral phosphatic beds can be traced eastward into Sinai, Transjordan and Syria and westward across the Libyan desert. Nubian facies and lagoonal deposits were developed over the continental surfaces near and inland of the Cretaceous shores. The history of Cretaceous transgression was broadly similar in Egypt, Libya, and the northern Sahara.

Similar conditions also obtained over the southern (Saharan) part of Barbary; but in the northern part (Tell Atlas), bathyal (Tethys) sediments accumulated.

The passage from Cretaceous to Palæogene introduces a number of small but important changes. In Palestine and adjacent territories sediments were laid down in deep bays bounded by land swells (bituminous chalk series): vertical movements therefore gave rise to gaps and discordances in Danian, Eocene and Oligocene beds. In two great north African embayments, Egypt – Libyan desert and Sirtica, Lower Eocene chiefly nummulitic limestones followed the Cretaceous, though the conformity between them is not perfect, and in the Tertiary gulf of Sirtica the Lower Eocene rests on Palæozoic and Mesozoic continental deposits. The Middle and Upper Eocene seas retreated northward to such an extent that the Oligo-Miocene shore line ran from the region of Cairo roughly westward nearly to Tripoli: the regions of the great Cretaceous – Lower Eocene shelf seas were land once more, with continental deposits of Nubian facies and notable cobble beds made of Eocene cherts.

Farther west, in the Sahara, end-Cretaceous regression was final: there was no major Eocene transgressive sea but only shrinking Algerian – Tunisian and western Moroccan bays with their valuable Cretaceous – Eocene phosphatic limestones. This marked dissimilarity with the east is associated with the convulsion of the Tethyan geosyncline and the creation, in part, of the Atlas mountain system, of flysch and bathyal deposits, largely at the expense of the northern shield rocks and their blankets of Mesozoic sediments; the bathyal Mesozoic beds of the geosyncline itself were also involved.

The movements responsible for the Cretaceous – Eocene disconformities, local and highly variable in their magnitude and significance between Saharan Barbary and the Levant, are no doubt related to that convulsion, but they are epeirogenic discordances, as Picard points out, remote from the geosyncline, devoid of a flysch facies; and their influence, mainly pre-Eocene, may also account for many changes of Mesozoic facies, both marine and continental.

In Palestine the rhythm of up-and-down movements was interrupted by a short-lived Lower Miocene (Burdigalian) phase of tangential folding, immediately succeeded by renewed uplift, extensive fracturing, block-movements, and some volcanic activity. Still greater uplift followed in the Pontian and in pronounced form at the end of the Pliocene. Picard remarks that the last of these transferred the Burdigalian fold-ranges into upwarp arches and downwarp basins. There is much that points to the Burdigalian of the Levant marking a major orogenic break between Palæogene and Neogene, the varied and thick inland deposits of which may be related to those of Iraq and adjacent territories. Already in Miocene times the fractures induced the formation of graben which, with the folding troughs, formed inland basins. Miocene to Pleistocene cycles of sedimentation took place in these basins, the tectonics of which, owing to the plasticity of their salt and gypsum, are complicated and of peculiar individuality.

The last major fracture phase in Palestine occurred between the Old and Middle Pleistocene and was accompanied by thick and widespread basaltic flows which have preserved large areas of the old land surface: movement has not yet ended. The Quaternary deposits of Palestine are therefore a legacy of the Miocene, and in the several distinct basins, especially that of the Jordan, their history can be traced in considerable detail.

On the Palestinian coast marine Neogene ingressions (Vindobonian, Astian) formed narrow embayments: there was no longer deep transgression over Transjordan. On the whole the Neogene, and perhaps the Oligocene, marked a great regression, with minor oscillations.

It is difficult at present to give an entirely satisfactory review of the north African Neogene development because much of it is still open to debate. It is well known that a much broken area lies between the Gulf of Suez and the Nile valley, in which certainly three directions of faulting may be recognized, in which also folded structures are prominent. Various interpretations have been put upon them: space forbids adequate discussion of a considerable controversy. Perhaps all that is vital and not controversial can be put in a few sentences. Oligo-Miocene or Burdigalian deposits both here and as far as Cyrenaica chronicle primarily destruction of the land by subaerial denudation: some of the beds may be marine, some fluviatile, and there are doubtless gaps in the sequence. Middle and Upper Miocene beds are mainly shallow-water marine limestones and marls. There were important Oligo-Miocene or Miocene basalt flows and sills. A conservative view of the fractures east of the Nile to Sinai is that they owe their origin to movement of blocks, that some of them are pre-Miocene, and that these made way for Miocene ingression, as in the Gulf of Suez, but that some of them are post-Miocene. Folds, some of them spectacular, may be related to bending induced

by faulting, but from eastern Egypt to the Libyan desert there are marked undulations running north-east – south-west across the broadly longitudinal swells. These remarks may apply in modified form to Cyrenaica. Between the Nile and Cyrenaica the country does not seem, on the whole, to have been so severely broken. West of Suez along the Egyptian coast fracturing probably ended before the Pliocene, or in its earliest stages. There was a period of great volcanic activity, of Tertiary to Recent age, in the interior.

Pliocene beds lie unconformably upon various Tertiary rocks. Important ingressions and regressions took place within the Pliocene itself, especially in Egypt, followed by lesser marine oscillations, finally recessive, in the Pleistocene.

From these facts, it may be implied that north Africa felt the repercussions of the Neogene upheavals in the geosynclinal Tethys, and reacted to them in a distinctive and recognizable manner. In Barbary the final stages of mountain building were enacted, accompanied by the exclusion of the Neogene gulfs from among the major mountain elements of the Tell. It was a long process, which contrasts sharply with the peculiar Burdigalian folding phase recognized in Palestine.

OBITUARIES

His Grace the Archbishop of Canterbury

THE death on October 26 of Dr. William Temple, Archbishop of Canterbury, was a sad blow not only to his intimates and his Church, but also to the rest of the nation and, indeed, the whole world. In the short two years of his primacy, Dr. Temple had earned and gained a unique place in the affection and regard of the people. Although erudite he was no dreary scholar ; although deeply religious he was not sanctimonious ; although a man of high standards he was charitable to others.

Much has been made in recent years of 'the conflict between science and religion', and the friction of this conflict has engendered more heat than light. The difficulty has been that so few men of science have understood religion, and most churchmen have been ignorant of science. William Temple bridged this intellectual gap and, perhaps even more important, bridged the gap in social intercourse. His years at Manchester and York gave him many opportunities to make contact with men and scientific organizations, and he made the most of them. His appreciation of science was well disclosed in his sermon in Manchester Cathedral before the Victoria University of Manchester during its jubilee celebrations in 1929. Then he emphasized the essential need for universities to foster scientific research alongside scientific training.

It was, however, since his translation to Canterbury in 1942 that Dr. Temple took the most active interest in the field of the social sciences. Especially valued was his help in the work of the Central Council for Health Education, of which he was president. His influence and prestige were invaluable, but he was no mere letter-heading. His conduct of the meetings of the Council was a model of chairmanship, and many passages were eased by his urbane humour and kindly wit.

Dr. Temple was truly a spiritual leader, but in the more everyday practical problems of human society he also took a leading part. He got, and helped others to get, at the roots of certain evils of social and industrial life. He realized that here were problems of the spirit, for the understanding of which a widespread general education is necessary before any attempt can be made at their solution. He held an important position in the Workers' Educational Association, being its president for sixteen years (1908–24). His very practical philosophy comes out in all his well-known books, but perhaps more than elsewhere in his Gifford Lectures of 1932–33 and 1933–34 on "Nature, God and Man", in which he pleaded for dialectical realism as opposed to the dialectical materialism of Marx. Onwards from then, and especially at the Malvern Conference, his sermons, addresses and writings convinced a wide public that the Church is not concerned with "another world" but is a strong social force in this. As *The Times* said : "he was a philosopher whose mind had been deeply given not only to classical studies but also to the problems of current thought".

Born in a bishop's palace, and educated at Rugby and Oxford, Dr. Temple yet was one of the common people. He towered above the rest of us, yet neither appeared himself to be aware of the fact nor did he make his fellows unduly conscious of it. Truly he was a leader of men.

Dr. Dorothy Ashworth

DR. DOROTHY ASHWORTH, whose untimely death at the age of thirty-six occurred on October 4, was, we had assumed, one of our coming plant pathologists. Her work on plant rusts began at the Royal Holloway College after she graduated from there in 1929, and it was during her second postgraduate year that Dr. Holden, on a visit to the College, saw and appreciated her skilful and immaculate technique in the isolation of sporidia and her inoculations with single sporidia. She was, in the following year, awarded a research studentship at University College, Nottingham, and continued the work in Prof. Holden's laboratory. The next year found her working in the Cryptogamic Laboratory of the University of Manchester, and from there she passed to the laboratory of the Royal Horticultural Society's Gardens at Wisley as assistant mycologist. Her work has been characterized throughout by exceptional thoroughness and sincerity. Her modest, unassuming manner masked a critical approach, sound judgment and a firm opinion. Her composed demeanour covered a meticulous care of the material in her charge and a constant watchfulness. There was no impatience for results, no haste to publish. Her attitude was simply that of a student seeking the truth. Science can ill spare such a faithful servant.

E. M. BLACKWELL.

DR. ASHWORTH joined the staff of the Royal Horticultural Society at Wisley Laboratory in the summer of 1935 as assistant to the mycologist. Before this her work had been concerned with pure research on various rust fungi, but she quickly adapted herself to the practical problems of horticultural plant diseases, and besides continuing valuable studies on various fungus parasites, notably the *Antirrhinum* rust fungus, *Puccinia Antirrhini*, rendered valuable assistance in the experiments on methods of control of diseases in certain ornamental and crop plants.

She was an ideal research worker, with a highly developed scientific and practical outlook, skilful, industrious and with a distinct flair for laying out and arranging experiments. Her technique was meticulous and her caution in studying data and reaching conclusions made for the utmost reliability.

At Wisley the very varied advisory and routine work precludes full-time attention to long-range research problems, but Dr. Ashworth investigated many diseases, such as a rust of rhododendrons, *Chrysomyxa Rhododendri*, the winter killing of wall-flowers, etc., and in collaboration with the writer was each year engaged in various field experiments on the control of various diseases of fruit, vegetables and flowers, for example, blight on outdoor tomatoes, club root of brassicas. In all this the standard of her work was always of the highest.

In 1943 she began the most important problem of her career, for which she was ideally fitted by training and inclination. The Dominion botanist of Canada approached the Council of the Royal Horticultural Society with the request that the very large collection of *Berberis* species and hybrids at Wisley be used for testing their susceptibility to black stem rust of wheat, as this knowledge was important in considering the importation of such plants in the Dominion. Accepting this work, she quickly made progress and recorded infection of some twelve species of *Berberis* by the wheat rust fungus once considered to be restricted only to *B. vulgaris*. Her special knowledge regarding the germination of teleutospores and sporidial infection, and her instinct for applying the correct technique in this kind of work, will be missed.

Visitors to the Wisley Laboratory will remember her engaging manner, and the many horticulturists who knew her will regret this loss to the science of horticultural plant pathology.

D. E. GREEN.

NEWS and VIEWS

Nobel Prize for Physiology and Medicine for 1944: Prof. J. Erlanger and Dr. H. S. Gasser

THEIR many friends on this side of the Atlantic will have been delighted to hear of the award of the Nobel Prize for Physiology and Medicine for 1944 to Dr. Joseph Erlanger, formerly professor of physiology at Washington University, St. Louis, and Dr. Herbert S. Gasser, director of the Rockefeller Institute, New York. The award recognizes a fundamental advance in the analysis of the nervous system. Nowadays, amplifiers and cathode ray oscillographs are part of the standard equipment of the neurophysiologist; the passage of the waves of activity in the peripheral nerve fibres can be timed to the nearest ten thousandth of a second and followed through the networks of the central nervous system with the same accuracy. It is to Gasser and Erlanger that we owe the introduction of this precision. They were the first to make effective application of new electrical techniques, after the War of 1914–18. By 1922 their cathode ray records had shown an unexpected complexity in the 'action potential' of a nerve trunk, and soon after they were able to prove that this was due to different groups of nerve fibres conducting at different rates.

An analysis of the groups in various nerves held out the hope of a close correlation between the function of the nerve fibre and its size and rate of conduction. A rigid correlation cannot be made, but the careful search for it has advanced our knowledge in many fields; for example, that of the mechanism of pain, of reflex activity and of inhibition. Erlanger and Gasser's work has inspired a large and active school of neurophysiologists to whom its precision and critical insight have set a very high standard. Their collaboration at St. Louis was cut short by Dr. Gasser's appointment as professor of physiology at Cornell University, but was renewed in 1936 in their Johnson Lectures on the "Electrical Signs of Nervous Activity". These lectures form an impressive account of the development of a new branch of neurological research.

The Lancet: Retirement of Dr. Egbert Morland

DR. EGBERT MORLAND, editor of *The Lancet*, has retired. Though thirty of his seventy years have been given to medical journalism, this was the third of his careers. Of a Quaker family, he took his B.Sc.(Lond.) from Owens College with first-class honours, and distinguished himself at St. Bartholomew's Hospital Medical College, winning the M.B. gold medal in physiology. But the series of junior hospital posts that should have led to consultant practice ended when, like many another house-physician of those days, he developed tuberculosis. In Switzerland he embarked on a second career: he took the Swiss federal diploma and the M.D. Berne, settled in Arosa, and became an expert in the disease he had overcome, writing a prize essay on sanatorium construction and many papers on tuberculin. The contentment of his trilingual practice, however, was destroyed in 1914. After relief work on the Marne, he came to London and called at *The Lancet*. The editor, Squire Sprigge, asked him to remain as his assistant, and in 1937 he succeeded to the editorial chair.

Dr. Morland's experience and talents alike fitted him to conduct a medical journal of international scope. He combines a taste for detail with a flair for essentials, and innumerable contributors have been grateful for his drastic sub-editing of their papers. By concentrating on the needs of the reader he has played no small part in bringing about the improvement evident of late years in the presentation of medical data. His editorial columns have been enlivened by an eager mind, always ready to reconsider even the most venerable hypothesis. Likewise his intense interest in social and medical reforms has arisen from the needs of people, never from theories. Having found *The Lancet* humane, he leaves it human. He was elected a fellow of the Royal College of Surgeons in 1936 and of the Royal College of Physicians in 1941.

The vacancies advertised in these columns are available only to applicants to whom the Employment of Women (Control of Engagement) Orders, 1942-8, do not apply.

SUNDERLAND EDUCATION COMMITTEE

THE TECHNICAL COLLEGE

Principal: F. H. Reid, B.Sc., Wh.Ex., M.I.Mech.E.

Applications are invited for the post of LECTURER in the Electrical Engineering Department to commence duties as soon as possible.

Salary (Burnham Technical Scale), £234—£15—£480, plus £52 war bonus.

The commencing salary will include an allowance for approved industrial or professional experience. An addition to the scale of £20 per annum will be paid after three years' service, under Clause 5 (c) of the Burnham Report in respect of "special work of an advanced character."

The standard of the full-time course is that required for an Honours Degree and of the evening courses for Higher National Certificates.

Candidates must possess a good Honours Degree in Engineering, or its equivalent, with qualifications in Electrical Machine Design, and should also have had industrial and teaching experience. A knowledge of Telecommunications will be an advantage.

Forms of application and further particulars may be obtained by sending a stamped addressed envelope to the Registrar, Technical College, Sunderland. Applications should be returned to the undersigned not later than Nov. 13, 1944.

W. THOMPSON,
Director of Education.

Education Offices,
15 John Street, Sunderland, Co. Durham.

SUNDERLAND EDUCATION COMMITTEE

THE TECHNICAL COLLEGE

Principal: F. H. Reid, B.Sc., Wh.Ex., M.I.Mech.E.

Applications are invited for the post of LECTURER IN MATHEMATICS to commence duties in January, 1945.

Salary (Burnham Technical Scale), £234—£15—£480, plus £52 war bonus. The commencing salary will include an allowance for approved professional or industrial experience. After three years' service an addition of £20 per annum will be made to the scale salary under Clause 5 (c) of the Burnham Report in respect of "special work of an advanced character."

Candidates must possess a good Honours Degree or its equivalent.

The standard of the full-time day course is that required for an Honours Degree in Science and Engineering, and for Higher National Diplomas, and the evening classes for Higher National Certificates.

Forms of application and further particulars may be obtained from the Registrar, The Technical College, and applications must be returned to the undersigned not later than Nov. 13, 1944.

W. THOMPSON,
Director of Education.

Education Offices,
15 John Street, Sunderland, Co. Durham.

ROYAL COLLEGE OF SURGEONS OF ENGLAND

PROPHIT RESEARCH STUDENTSHIP

A candidate will shortly be nominated by the Council of the Royal College of Surgeons of England for a Prophit Studentship in Cancer Research.

The annual value of the Studentship will be £500 with an allowance not exceeding £200 for expenses of travelling, and will be for nine months in the first instance, but renewable annually at the discretion of the Special Trustees on the nomination of the Council of the College.

Students may be male or female.

Applications, giving a statement of the proposed research and place of work, and accompanied by a recommendation from a member of the staff of the applicant's Medical School or University, should be sent to the Secretary, Royal College of Surgeons, Lincoln's Inn Fields, W.C.2, before Nov. 28, 1944.

KENNEDY CASSELS,
Secretary.

UNIVERSITY OF LONDON

NOTICE IS HEREBY GIVEN that the Senate will proceed shortly to appoint an Examiner in Chemistry for the Higher School Examination for the year 1945.

The Examiner appointed will have a colleague.

An application form and particulars of the remuneration and duties can be obtained from S. H. Shurrock, M.A., Secretary to the Matriculation and School Examinations Council, to whom the application form must be returned by candidates, with any attestation of their qualifications they may think desirable, on or before Monday, Nov. 20, 1944. If testimonials are submitted, one copy only of each is required. In no case should original testimonials be submitted.

The Senate desire that no application of any kind be made to individual members.

H. CLAUGHTON,
Principal.

University of London,
at Richmond College,
Richmond, Surrey.

APPOINTMENT OF BOTANIST

Applications are invited for the post of BOTANIST (male) in the Branch of Plant Pathology and Botany of the Department of Agriculture, Southern Rhodesia. Candidates should possess an Honours Degree of a University in the British Empire or equivalent. The appointment will be at first on contract for two years at a salary of £400, at the termination of which the officer will be eligible for appointment to the Fixed Establishment in Grade A.7, rising by annual increments of £25 to £850 per annum. A higher commencing salary may be paid to the successful candidate, according to qualifications and experience, and he will be required to assume duty at the earliest possible date.

The successful applicant will be required to submit a satisfactory medical certificate from a Government Medical Officer.

Applications, stating nationality and marital conditions, accompanied by copies of testimonials, including degree certificates, should be addressed to the Official Secretary, Rhodesia House, 49 Strand, London, W.C.2. Canvassing will disqualify applicant.

Wanted: A set of Analytical weights, good make.—Particulars to Sutton, 9 Dene View, Newcastle 3.

UNIVERSITY OF BRISTOL

DEPARTMENT OF ZOOLOGY

Required immediately, a laboratory steward or laboratory technician. Candidates must have practical experience in the preparation of class material, including histological technique in photography and in laboratory workshop practice.

The commencing salary will be £220 or more, according to experience, plus war bonus. Superannuation is under the F.S.S.U.

Applications, giving full details of age and experience, should be addressed to the Registrar, The University, Bristol 8.

BRISTOL MUSEUM AND ART GALLERY

Applications are invited for the post of TEMPORARY ASSISTANT in the Department of Zoology for a period of about 18 months commencing Jan. 1, 1945. Duties will be chiefly concerned with technical and preparatory work. Salary £350 per annum.—Applications should reach Deputy Director, Museum and Art Gallery, Bristol 8, by Saturday, Dec. 9.

Applications are invited for the appointment of ASSISTANT CURATOR for the Kaffrarian (Natural History) Museum, King William's Town, Cape Province, South Africa. Previous Museum or University experience Higher Vertebrates essential. Periodical field expeditions. Preference to young unmarried man with war service. Salary £300—£50—£400. Second-class passage to South Africa.—Applications to Director, Kaffrarian Museum, King William's Town.

Laboratory Assistant (Male) required to start work in January. New Science Block in Boys' Public School. Duration appointment. Salary up to £5 per week, according to qualifications.—Headmaster, St. Albans School, Abbey Gateway, St. Albans.

Wanted: Complete sets and runs of Scientific Periodicals, including NATURE and Learned Society publications.—The Scientific Book Supply Service, 5 Fetter Lane, London, E.C.4.

Microcopying. — Typescripts, Rare Books, Scarce References Copied. 2d. per page (minimum 3s. 6d.). Send by registered post to: Adrian Cotes, 68 Carlton Hill, N.W.8.

Typing, Duplicating and Statistical Work intelligently done. Copying of scientific manuscripts a speciality. Recommended.—Mrs. Pearce, 26 Felbridge Avenue, Stanmore, Middx.

Pauling's "Nature of the Chemical Bond" urgently required by Honours Students. Buy or borrow against deposit.—Address, "Chemical," Wm. Porteous & Co., Glasgow.

Microscope (Smith & Beck) perfect condition, fine instrument; 50 gns.—Oglethorpe, Tollgate Cottage, Henley-on-Thames.

Microscopes, of all descriptions, only a few available, second-hand, perfect condition. Send details of your requirements, enclosing 3d. stamp.—Telephone or correspondence only: Chards, Forest Hill, S.E.23 (Spring Park 1628).

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Prof. A. G. Pugsley, O.B.E.

DR. A. G. PUGSLEY has been appointed to the chair of civil engineering in the University of Bristol formerly held by Prof. J. F. Baker, who was appointed in 1943 to succeed Prof. C. E. Inglis at Cambridge. Prof. Pugsley was educated at Rutlish School and Battersea Polytechnic, and graduated with first-class honours in engineering in the University of London in 1923. After serving as a student-apprentice in civil engineering at the Royal Arsenal, Woolwich, he was appointed a junior technical officer for design and research work at the Royal Aircraft Establishment Works, Cardington. In 1931 he transferred to the Royal Aircraft Establishment as a scientific and technical officer, where he is now the head of the structural and mechanical engineering department. In 1938 he was awarded the degree of D.Sc. of the University of London. He is a member of several sub-committees of the Aeronautical Research Committee and of the Ministry of Production. Dr. Pugsley has made notable contributions to engineering science, particularly in connexion with the structural design of aircraft and airworthiness, and the aero-elastic problems involved.

British Non-Ferrous Metals Research Association: Mr. G. L. Bailey

THE British Non-Ferrous Metals Research Association has appointed Mr. G. L. Bailey as director to succeed Dr. H. Moore who has retired (see *Nature*, October 14, p. 482). Mr. Bailey graduated in metallurgy at the University of Birmingham, where he was awarded the degree of M.Sc. in 1922 after completing two years research work. During 1922–30 he was on the staff of the Research Department, Woolwich, where he carried out research on a variety of problems in non-ferrous metallurgy. During this period his most notable work was on the casting of 70/30 brass ingots for subsequent rolling, the results of which were published in association with Dr. R. Genders by the British Non-Ferrous Metals Research Association in a monograph "The Casting of Brass Ingots".

In 1930 Mr. Bailey resigned from the Research Department at Woolwich to accept the appointment of development officer of the British Non-Ferrous Metals Research Association. In this post he was responsible for fostering the application of the results of the Association's researches in industry. He played, however, a wider part in the Association's organization and in January 1942 became deputy director. Mr. Bailey is a vice-president of the Institute of Metals and chairman of the London Local Section of that body.

Lister Memorial Lecture of the Society of Chemical Industry

THE first Lister Memorial Lecture of the Society of Chemical Industry will be delivered by Sir Alexander Fleming in the Anatomy Lecture Theatre, University of Edinburgh, on November 9 at 5.30 p.m. The subject of the address will be "Antiseptics". Under the auspices of the Society of Chemical Industry, endowed memorial lectures have recently been founded in different parts of Great Britain to perpetuate the memory of scientific men and industrialists whose work has assisted in building up the chemical industry. The name of the late Lord Lister has been chosen for commemoration in the Edinburgh and East of Scotland Section of the Society on account of his connexion with Edinburgh and because of the stimulating effect his revolutionary medical methods had on the growth of the fine chemical industry in Great Britain. The endowment has been the gift of two Edinburgh pharmaceutical chemical manufacturers, Messrs. J. F. Macfarlan and Co. and Messrs. T. and H. Smith, Ltd. The lecture will be delivered every four or five years in Edinburgh, Aberdeen or St. Andrews.

Research on Tsetse Fly and Disease

THE Secretary of State for the Colonies has appointed a committee to consider and advise on the co-ordination of action, including research, directed against human and animal trypanosomiasis, and, in particular, against the tsetse fly as the chief vector. The committee, on which the Dominions Office and the Sudan Government are represented, will report from time to time to the Secretary of State for the Colonies, and on all matters affecting research its recommendations will be referred to the Colonial Research Committee for comment and advice before submission to him.

The committee is composed as follows: Mr. G. H. Creasy (chairman), Colonial Office; Sir Robert Archibald, representative of the Sudan Government; Prof. P. A. Buxton, London School of Hygiene and Tropical Medicine; Dr. H. Lyndhurst Duke, lately director of the Human Trypanosomiasis Institute in Uganda, and chairman of the League of Nations Sleeping Sickness Committee; Mr. S. A. Goulborn, Dominions Office; Prof. I. M. Heilbron, Imperial College of Science and Technology; Dr. E. M. Lourie, Liverpool School of Tropical Medicine; Sir Guy Marshall; Dr. S. A. Neave, director of the Imperial Institute of Entomology; Mr. G. F. Seel, Colonial Office; Dr. A. G. H. Smart, medical adviser to the Secretary of State for the Colonies; Mr. John Smith, adviser on animal health to the Secretary of State for the Colonies; Dr. H. A. Tempany, agricultural adviser to the Secretary of State for the Colonies; and Mr. C. W. F. Footman (secretary), Colonial Office.

Cinemicrography

Two complementary papers dealing with cinemicrography were given at a meeting of the Association for Scientific Photography on October 14. Mr. H. Emmett described the apparatus used in one of the I.C.I. research laboratories, consisting of a petrological microscope, above which is supported the cine camera without its lens, while the microscope is also used without the usual eyepiece, but with a viewing attachment to enable the image to be kept under observation while being filmed. Focus on the film is ensured by inserting a piece of ground glass in the gate and balancing this image with the one seen in the viewing eyepiece; careful centring of the light is obviously of first importance. A 9·5 mm. camera was used connected through a belt drive to an electrically controlled gramophone motor which enables exposures to be taken at known intervals. Mr. Emmett showed films illustrating crystal growth, such as the change in crystalline form induced by the presence of impurities, the allotropic change in acicular crystals of ammonium nitrate which can take place on lowering the temperature, and the concentration gradient around a crystal during growth.

The second paper, by Mr. R. McV. Weston, entitled "Cinemicrography in Biological Research" dealt with similar problems but described a more elaborate

apparatus for higher power micrography and using a 16 mm. Cine-Kodak Special camera to record the images. Owing to the employment of living specimens, a rotating sector shutter was used to prevent overheating and the whole of the microscope stage was enclosed in an incubator, the necessary controls being outside. The heating elements were two 30-watt carbon filament lamps shielded to prevent direct rays reaching the object and a chloroform-mercury thermostat next to it. As in the first apparatus, the light was provided by a 100 c.p. Pointolite lamp. Mr. Weston showed a film of the movement of the leucocytes among the red corpuscles of the blood, and higher magnifications showed very clearly the triple nuclei.

Electrical Accidents

IN a memorandum (*J. Inst. Elec. Eng.*, **91**, Pt. I, No. 43; July 1944) which assesses electrical accidents in relation to other accidents, and includes an appraisement of some electrical fire statistics, the published statistics of fatal accidents in Great Britain are analysed and the proportion of those of electrical origin are assessed in their relationship to the whole with special consideration of those occurring on domestic premises. Certain statistics concerning fires attributed to electrical causes in both domestic and industrial premises are studied, and the contributing factors are analysed in the order of their importance. It is concluded that electrical accidents have shown no significant increase in relation to the increased use of electricity. The number of fatal accidents due to defective installations tends towards a very low figure; but increasing attention should be given to the quality and maintenance of flexible connexions of the portable appliances employed in domestic situations and to the design and maintenance of the appliances themselves.

Statistics on the incidence of electrically caused fires are not adequate and do not give precise information on the primary causes of such fires. It appears that some 35 per cent of all fires attributed to electrical causes arise from faults in the fixed installations; but of the total fires attended, only 1·7–3·5 per cent are attributable to installation defects. The figure for domestic and similar premises is deemed to be lower than this, while the effect of improved techniques, the elimination of D.C. supplies, the use of new materials, and the provision of installations integrally planned in relation to other services in the structure, will all tend to produce a further reduction in the risks. A study of the commoner causes of fires indicates that, in addition to an expected decline in electrically caused fires in proportion to the utilization of electricity, a substantial decrease in the total number of fires is likely to occur as electricity supplants other fuels as a means for space-heating, water-heating and cooking.

Royal Society of Edinburgh: New Officers

AT the annual meeting of the Royal Society of Edinburgh held on October 23, the following officers were elected: *President*, Sir William Wright Smith; *Vice-Presidents*, Prof. T. H. Milroy, Sir John Boyd Orr, Dr. A. W. Greenwood, Prof. E. Hindle, Dr. D. Russell, Prof. R. J. D. Graham; *General Secretary*, Prof. J. P. Kendall; *Secretaries to Ordinary Meetings*, Prof. W. M. H. Greaves, Prof. A. Holmes; *Treasurer*, Sir E. M. Wedderburn; *Curator of Library and Museum*, Dr. J. E. Mackenzie; *Councillors*, Mr. Stanley Cursiter, Dr. Douglas Guthrie, Prof. J. W. Heslop Harrison, Mr. A. W. Young, Prof. E. T. Copson, Lieut.-Colonel W. F. Harvey, Prof. A. E. Trueman, Prof. J. Walton, Prof. T. Alty, Mr. J. Morrison Caie, Sir Robert Muir, Sir David K. Murray.

Announcements

THE Joint Committee of the Royal Physical Society, the Royal Scottish Geographical Society and the Royal Society of Edinburgh has awarded the Dr. W. S. Bruce Memorial Prize (1944) to Lieut. T. H. Manning, R.C.N.V.R., for his valuable survey and biological work during 1931–39 in Iceland, Lapland, Southampton Island, Hudson Bay and at Foxe Basin (1936–39).

AFTER the liberation of Paris, the secretary of the British Association was enabled, through the courtesy of M. Louis Rapkine, of the Mission scientifique française en Grande-Bretagne, to address a letter of goodwill to Prof. A. Verne, secretary-general of the French Association for the Advancement of Science. A message of greeting and hope for the early renewal of active relations between the two Associations has now been received by the Council of the British Association from Prof. Verne on behalf of the president and bureau of the French Association.

DR. A. N. MAY, lecturer in physics at King's College, University of London, has been appointed as from October 1 to the University readership in physics tenable at King's College. Since 1942 Dr. May has been on war service with the Department of Scientific and Industrial Research.

The following doctorates have been conferred by the University of London: D.Sc. on C. N. Acharya, Rothamsted Experimental Station; A. L. Green, King's College; Miss L. E. Hawker, Imperial College of Science and Technology. D.Sc.(Econ.) on B. R. Misra, London School of Economics.

THE following appointments have recently been made by the Colonial Office: R. J. Dewar and J. G. McQuillen, to be assistant conservators of forests, Nigeria; K. W. Aspinall, to be veterinary officer, Tanganyika; J. J. Steyn, to be entomologist, Uganda; J. N. Clothier and R. H. Fraser, agricultural officers, Northern Rhodesia, to be senior agricultural officers, Northern Rhodesia; D. F. Macpherson, veterinary officer, Kenya, to be senior veterinary officer, Kenya.

AN exhibition of historic scientific instruments and books, drawn from the collection which Mr. R. S. Whipple is presenting to the University of Cambridge, will be held in the East Room of the Old Schools during November 4–11. The exhibition will be opened by Sir Henry Dale, president of the Royal Society, on November 4 at 2.45 p.m., and will remain open on weekdays from 10 a.m. to 5 p.m. Admission is free. It is intended that the Whipple Collection shall form the nucleus of a museum of the history of science in the University.

PROF. J. HADAMARD will be unable to give the lecture announced for the annual general meeting of the London Mathematical Society on November 16. Prof. S. Mandelbrojt will give a lecture "On the Regularization of Sequences". It is hoped that Prof. Hadamard may be able to lecture at a later meeting.

LETTERS TO THE EDITORS

The Editors do not hold themselves responsible for opinions expressed by their correspondents. No notice is taken of anonymous communications.

Fetuin, a New Globulin Isolated from Serum

DURING a study on the fractionation of serum with ammonium sulphate, I thought it worth while to try whether some of the serum proteins could be isolated more easily from the serum of a newly born animal. Serum from calves not more than two weeks old was used for these fractionation experiments, which immediately indicated a pronounced difference between the serum from the calf and that from the cow. Ultracentrifugal examination of the different fractions revealed the presence of large amounts of a globulin with the sedimentation constant, s_{20}, of the order $3S$ ($1S$ (Svedberg) $= 1 \times 10^{-13}$ c.g.s.) as compared with the normal $s_{20} \sim 7S$ for serum globulin. The main part of the new protein was precipitated between the salt concentration limits 0·37 and 0·45 saturated ammonium sulphate. It was purified further by fractionation with ammonium sulphate and centrifugation in a high-speed air-driven centrifuge. Molecular weight determination gave a value of the order 50,000 [1].

Experiments with serum from calves of different ages have shown that the amount of this globulin has its highest value in the newly born calf, and decreases with time. In the adult cow, its presence may be demonstrated in the fractions which correspond to those from the newly born calf where the new globulin is the predominant component. It seems reasonable to assume that the concentration of the new protein shows its maximum value in the fœtus and that it is in some way associated with the period when the greatest building and development of the animal takes place. I therefore propose that this new protein be called 'fetuin'. The name is derived from the Latin name for fœtus, namely, *fetus*.

Later experiments with fœtal sera from cow and sheep have shown that the 'total globulin' obtained from these liquids mainly consists of fetuin, whereas the presence of ordinary globulin with $s_{20} \sim 7S$ can just be demonstrated. Serum from human umbilical blood was also examined, but its contents of fetuin was only a few per cent. The same serum, however, contained considerable amounts of globulin with $s_{20} \sim 7S$. A similar result was obtained with rabbit fœtal serum, whereas foal serum behaved similarly to that from the calf.

The same grouping of the species (cow, horse and sheep on one side, and man and rabbit on the other) is found in one of their immunological properties. Thus placental transmission of antibodies takes place in the latter group, while the newly born animal of the former group receives its antibodies with the colostrum, when it is suckled for the first time (see ref. 2). There is also a distinct difference between the two groups in the construction of the placenta. In the case of ruminants, the placenta consists of three layers of cells, whereas in rodents and man the maternal blood is separated from the fœtal by only a single layer of cells.

It is still an open question whether or not fetuin is generally present in embryonic serum. In this connexion, it is of interest to note that Svedberg and Andersson [3] several years ago, in an unpublished investigation, found that no component with $s_{20} \sim 7S$ was present in serum from chicken embryo after 11–15 days incubation. The 'albumin peak' in the sedimentation diagram, however, was very asymmetrical and gave comparatively low values for the sedimentation constant. The low value for s_{20} in this case may perhaps be explained by the possible presence of fetuin in the embryonic serum. After 18 days of incubation the globulin amounted to 22 per cent of the protein, and the 'albumin peak' had become more symmetrical.

Differences between hæmoglobins from adult and from fœtal blood have been reported from time to time, and it was generally supposed that they were to be found in the protein moiety of the molecule. Several years ago, G. S. Adair [4] found that maternal and fœtal hæmoglobin from sheep could be easily distinguished in electrophoresis. Quite recently, Wyman *et al.* [5] have demonstrated great differences in the solubility of maternal and fœtal hæmoglobin from the cow. At the same time, Andersch *et al.* [6] showed that the electrophoretic mobility is not the same for hæmoglobin from a newly born infant as that from an adult. The two sedimentation constants were also unlike ($s_{20} = 2{\cdot}5S$ for the infant and $4{\cdot}7S$ for the adult).

It is thus evident that in the case of the respiratory proteins and also in the serum proteins, great differences exist between their properties in the embryonic state and in the adult animal. This investigation is being continued, and details will be published elsewhere.

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Sept. 13.

[1] Pedersen, K. O., in "The Svedberg 1884 30/8 1944" (Uppsala: Almqvist and Wiksell, 1944), 490.
[2] Kuttner, A., and Ratner, B., *Amer. J. Dis. Child.*, **25**, 413 (1922).
[3] Svedberg, The, and Andersson, K. I. J., private communication.
[4] Cf. Tiselius, "The Harvey Lectures" XXXV, 1939–1940, 67.
[5] Wyman, J., Rafferty, J. A., and Ingalls, E., *J. Biol. Chem.*, **153**, 275 (1944).
[6] Andersch, M. A., Wilson, D. A., and Menten, M. L., *J. Biol. Chem.*, **153**, 301 (1944).

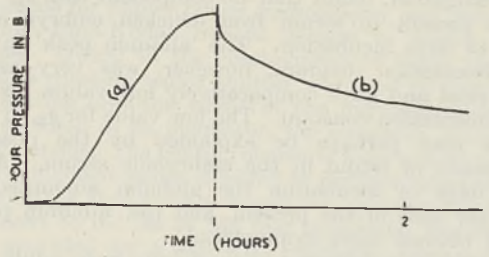
Permeability of Keratin Membranes

BARRER [1] has suggested that the diffusion of vapours through media in which sorption and swelling occur are governed by a generalized form of Frick's Law, in which the diffusion constant is a function of the vapour concentration in the specimen.

Recent measurements in these laboratories of the diffusion constant of water vapour in keratin have provided an example of this phenomenon. At water contents below 6 per cent on the dry weight, the diffusion constant becomes extremely small in comparison with its value at higher concentrations.

This property of keratin may be demonstrated very simply as follows. Two compartments A and B, separated by a film of horn a few thousandths of an inch thick, are both evacuated. Then on introducing water vapour into A the subsequent rise in pressure in B follows Curve a. The diffusion is slow until the film acquires a water content of about 6 per cent throughout, when a rapid increase in transport occurs, despite the decreasing pressure difference across the membrane, because of the large increase in the diffusion constant.

If, after equilibrium is attained, the water vapour is rapidly removed from A, the fall in pressure in B



becomes extremely slow after an initial rapid drop (Curve *b*). This is clearly due to a decrease in the water content on the side of the film adjacent to *A*, to a value below 6 per cent, which opposes the attempt to reduce the pressure in *B* by the rapid evacuation of *A*.

This phenomenon may be common to all such absorbing films. Sir Charles Martin informs me that attempts to increase the rate of evaporation of liquid water through a collodion film by forced air circulation always lead to a decrease in the rate of evaporation as compared with that in still air.

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Oct. 4.

[1] "Diffusion in and through Solids" (Cambridge University Press).

Variations in the After-Glow Brightness of Active Nitrogen Under Varied Experimental Conditions

LORD RAYLEIGH, in a remarkable series of experiments, has studied photometrically the variations in the after-glow brightness of active nitrogen under varied experimental conditions. The results are of extreme importance in testing the various theories of active nitrogen. In the present note, some of these results will be considered in the light of the hypothesis recently proposed by me[1,2], namely, that active nitrogen is simply the ionized nitrogen molecule in the N_2^+ (X') state produced by the discharge. If the walls of the vessel are suitably 'conditioned' to prevent the surface from acting as catalyst, the recombination of the positive ions with electrons proceeds mainly in the volume of the gas by a three-body collision process in which neutral nitrogen molecules act as the third body.

The experimental results discussed are as follow:

(1) The intensity of the glow in a vessel in which the active material is lost largely on the walls of the vessel falls exponentially with time t; the time required for the intensity, at any stage, to fall to its half-value is constant[3]. This is a characteristic of a unimolecular reaction. (The walls of the experimental vessel were 'poisoned' with Apiezon oil.)

(2) The intensity of the glow in a vessel in which the active material is lost mainly in the volume of the enclosing vessel varies inversely as t^2. This is a characteristic of a bimolecular reaction[4]. (The walls of the vessel in this case were coated with metaphosphoric or strong sulphuric acid to prevent surface reaction.)

(3) If the glowing gas is compressed, the intensity of the glow increases as the cube of the concentration[5]. This is a characteristic of a termolecular reaction.

(4) If the temperature of the glowing gas be lowered keeping the pressure constant, then, making allowance for increase of intensity due to increased concentration, the reaction-rate is found to have a negative temperature coefficient; it increases with the decrease of temperature[6].

To explain (1) we note that the recombination on the walls proceeds as follows. The electrons, on account of their higher velocity (due to smaller mass and to higher 'temperature'), arrive first on the surface (the 'poisoned' parts of it) and remain there as surface charge. The positive ions then arrive and become neutralized, giving up the energy of recombination to the glass walls. The poisoned or active parts of the glass thus play the part of the third body. The reaction-rate at any instant is obviously proportional to the active area and to the number of positive ions colliding with it per second. Since the active area remains constant, the number of recombinations is simply proportional to the rate at which the positive ions collide with the wall per second, and this in its turn is proportional to the density of N_2^+ ions in the volume. The positive ion density and the reaction-rate thus fall exponentially with time, which gives the law of decay for a unimolecular reaction.

To explain (2) we recall that according to J. J. Thomson[7] the coefficient of recombination of electrons and ions (α) by three-body collision is given by $\pi d^2 u/\lambda$, where $d = 2e^2/3kT$ is the minimum distance of approach for the electron and the ion for effective three-body collision, T is the electron temperature, u the mean velocity of agitation of the electrons and λ the mean free path—or rather, the mean energy free path—of the electrons. Now, the reaction-rate in the volume (temperature and pressure remaining constant) is given by αn^2, where n is the electron or positive ion density, assuming the two to be the same. From the expression for α, we note that it is independent of n. The reaction-rate at any instant is thus proportional to n^2 and this explains the observed characteristic of the bimolecular reaction.

To explain (3), note that the reaction-rate αn^2 is equal to $(\pi d^2 u) n^2/\lambda$. When the glowing gas is compressed as a whole, the electron-ion concentration n varies directly, and the energy free path λ varies inversely, as the pressure. The reaction-rate, and hence the brightness of the glow, increases as the cube of the compression, which is a characteristic of a termolecular reaction.

To explain the negative temperature coefficient (4), note that in the expression for α, λ is independent of T, d varies inversely as T and u varies directly as $\sqrt{T}$. α and, therefore, the reaction-rate, will vary as $T^{-5/2}$ (the concentration remaining constant). The hypothesis therefore predicts a negative temperature coefficient of the reaction-rate, as observed by Rayleigh. The calculated coefficient, however, appears to be much higher than the observed coefficient $T^{-0.64}$. (In Rayleigh's experiment a part of the observation vessel—a tube attached to it—was cooled while the pressure remained constant. The increase of intensity due to increased concentration was allowed for in computing the coefficient. The observed coefficient was for the extreme range of temperature investigated, 90°–373° Abs.)

The discrepancy is explained if it is remembered that the temperature T in the expression for α refers to the electron temperature and not to the molecular temperature. It is the latter temperature, however,

that was used in computing the coefficient ; we do not know how the electrons in the observation tube were affected by the temperature variation of the medium surrounding it. It can, however, be safely assumed that on account of the high initial value of the electron temperature, its percentage variation was much less than the percentage variation of molecular temperature. The temperature coefficient computed by taking the molecular temperature is therefore necessarily smaller than the true coefficient. (It is to be remembered that J. J. Thomson's expression for α has not been tested for the pressures such as are ordinarily encountered in discharge tubes, and it is doubtful if the formula is strictly applicable to such cases, particularly because of the uncertainty regarding the energy free path λ. Nevertheless, the formula can be assumed to give, at least qualitatively, the nature of the variation of α with temperature, pressure and concentration).

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Calcutta. Sept. 14.

[1] Mitra, S. K., *Science and Culture* (Calcutta), **9**, 49 (1943) ; **10**, 133 (1944).
[2] Mitra, S. K., *Nature*, **154**, 212 (1944).
[3] Rayleigh, Lord, *Proc. Roy. Soc.*, A, **151**, 567 (1935).
[4] Rayleigh, Lord, *Proc. Roy. Soc.*, A, **176**, 1 (1940) ; see data in p. 5 ; see also ref. 3, p. 576.
[5] See ref. 4, p. 10.
[6] See ref. 3, p. 13.
[7] Thomson, J. J., *Phil. Mag.*, **47**, 337 (1924).

Borax as a Standard Buffer Solution

USERS of glass electrodes frequently require for purposes of standardization an easily prepared buffer solution in the region of *p*H 9, and use is generally made of an *M*/20 solution of A.R. borax, which according to tables[1] has a value of 9·23 at 20° C.

In the investigation of small errors in glass electrodes, it was found that the *M*/20 borax solution gave results which were invariably lower than the accepted values by about *p*H 0·05, and it was thought that these irregular results should be investigated as other workers might find similar difficulties in correlating data.

Samples of A.R. grade borax, made by reputable manufacturers, were first used, but it was found that when the solutions were prepared under the same conditions the results were uniformly low, indicating that the irregular results were not apparently due to methods of preparation of the material.

It has been stated[2] that *M*/20 borax solution has a *p*H value of 9·18 at 25° C. when the salt is treated so that it has the correct state of hydration, and as a check on this point a sample of borax was dehydrated to avoid errors of hydration. The *p*H value of an *M*/20 solution of the salt so prepared was $9{\cdot}13_2$ ($9{\cdot}17_2$ at 20° C.), which is still below the correct value.

A second sample was now prepared by dissolving the salt in boiling water to which sodium hydroxide was added to neutralize any possible traces of free boric acid. The salt was recrystallized from this solution and again recrystallized twice from distilled water. The product of each crystallization was filtered under vacuum and washed with distilled water. The final product was dried between filter paper in the air. A solution *M*/20 in strength was used for the test.

All the *M*/20 solutions were prepared from distilled water boiled in a 'Pyrex' flask and cooled with a soda-lime tube absorber for carbon dioxide. The *p*H measurements were made with hydrogen and calomel electrodes kept at constant temperature for 24 hours previous to the tests. Under these conditions the calomel cell has been found to give potentials in agreement with those given by Michaelis[3], and as a check an *M*/20 potassium hydrogen phthalate solution (*p*H 3·97) was tested. This showed the calomel cell had a potential correct to within 0·2 millivolt of Michaelis' values, and all readings of the various tests on the borax solutions were steady to 0·2 millivolt.

Hydrogen electrode ° C.	Calomel electrode ° C.	E.M.F. mV.	*p*H	*p*H reduced to 20° C.
20·2	20·5	782·6	$9{\cdot}18_2$	$9{\cdot}18_0$
20·8	21·2	782·6	$9{\cdot}17_0$	$9{\cdot}17_6$
21·0	21·2	782·8	$9{\cdot}17_7$	$9{\cdot}17_4$

From a long series of tests extending over several years, it has been found that the temperature coefficient of the *M*/20 solution of borax as given by Walbum[4] is quite correct even though the absolute *p*H value differs from his figures somewhat.

The *p*H values at 20° C. are computed on the basis of Walbum's figures, and rounding them off to the nearest *p*H 0·01, which is the limit of accuracy of ordinary *p*H measurements, it would seem that a value of 9·18 for an *M*/20 solution of $Na_2B_4O_7.10\ H_2O$ made up with carbon dioxide – free distilled water represents the more correct figure than 9·23 usually given.

It is difficult to offer any explanation of the discrepancy, since the original figures given by Walbum were presumably made with a hydrogen electrode. The value of 9·18 at 25° C. quoted by Hitchcock and Taylor[1] may have been based on a value of *p*H $4{\cdot}00_5$ for *M*/20 potassium hydrogen phthalate. Reducing their figure to the more usual value of 3·97, this gives 9·15, which is still *p*H 0·02 above the value usually found, a small but very definite discrepancy. It would be interesting to learn other workers' opinions on this point.

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Sept. 22.

[1] "Hydrogen Ions". By H. T. S. Britton.
[2] Hitchcock, D. I., and Taylor, A. C., *J. Amer. Chem. Soc.*, 1812 1937).
[3] Michaelis, L., "Die Wasserstoffionenkonzentration".
[4] Clark, W. M., "The Determination of Hydrogen Ions".

Identification of the Montmorillonite Group of Minerals by X-Rays

THIS group of clay minerals (referred to hereafter for brevity simply as "montmorillonite"), which is often found in soil clays, fuller's earth and bentonite, is characterized by the variation of the position of the basal reflexion, on an X-ray powder or aggregate diagram, from about 10 to about 18 A., according to the state of hydration[1]. The minerals of the group are notoriously difficult to identify positively from a single X-ray diagram because (*a*) the line at 14 A., which is given by montmorillonite in a normal state of hydration, is liable to be confused with a basal

reflexion from chlorite or vermiculite, both of which might occur in soil clays; and (*b*) the basal reflexion may be diffuse, due to the simultaneous occurrence, in the crystallites, of two or more different basal spacings.

The former difficulty has been mentioned by Nagelschmidt[2], who recommends taking photographs of the clay at different stages of hydration, as a means of surmounting it; and the latter has been discussed in several papers by Jackson and co-workers[3], who have recommended a special procedure for the controlled hydration of montmorillonite, which they claim ensures a sharp reflexion at about 16 A. If these recommendations are to be followed, the procedure necessary for the mere identification of montmorillonite in clays will clearly be complicated and time-consuming.

For this reason, it seems worth while to direct attention here to a very simple and apparently quite unambiguous method which I have been using for some time for the purpose. It depends on the observation (made during some as yet unpublished research on the effect of absorption of alcohols on the montmorillonite lattice) that when montmorillonite is treated with glycerol, a very sharp and intense first-order basal reflexion is obtained at about 17·7 A., as well as a number of higher orders. The line at 17·7 A., being well separated from any lines due to other likely minerals, is very suitable for identification. All that is necessary is to add glycerol to a clay suspension at the rate of about one drop to each 80 mgm. of clay, and then evaporate to dryness. The latter operation may safely be completed on a steam bath or in a desiccator. This technique may be combined with Nagelschmidt's aggregate technique[4] by adding the right amount of glycerol to the clay suspension which is to be used for forming the aggregate.

From tests which I have carried out, it appears that the following advantages may be claimed for this method.

(1) *Wide applicability.* The method has been tried so far on montmorillonites from fuller's earth and bentonite, on nontronite, on Hector clay (octophyllite montmorillonite), and on a number of soil clays containing montmorillonite, and has given essentially the same result in all cases, at any rate so far as the first order of the basal reflexion is concerned. The ratios of the intensities of the different orders of the basal reflexion probably vary somewhat in the different types of montmorillonite minerals; but this is not very important from the present point of view.

(2) *Great sensitivity.* In a test to discover the minimum quantity of montmorillonite in a mixture which can be detected by this method, using kaolin as diluent, it was found that 1 per cent of montmorillonite gave a visible 17·7 A. reflexion on an aggregate diagram.

(3) *Insensitivity to hydration conditions.* Samples which were (*a*) dried on a steam bath, (*b*) dried over phosphorus pentoxide at room temperature, and (*c*) allowed to stand over water for a week at room temperature gave essentially the same powder diagram. In particular, the position of the 17·7 A. reflexion seemed to remain quite unchanged. Thus the glycerol treatment may be said to eliminate the undesirable results of the expanding lattice of montmorillonite. Other polyhydric alcohols, such as ethylene and trimethylene glycols, give rather similar effects with montmorillonite; but in all other cases tried so far, the basal spacing varies with the state of hydration.

(4) *Easy distinction from other clay minerals, including illite (hydrous mica).* The 17·7 A. reflexion is very characteristic, and the second-order reflexion at 8·85 A. does not interfere with a line given by any other likely mineral. Moreover, tests with illite (from Grundy County, Illinois) show that the position of its basal reflexion is completely unaffected by the treatment. In view of the claims of Jackson *et al.*[3] that an expansion of the illite lattice may be caused by certain hydration procedures, this point is not without importance.

Part of the work mentioned above was done during the tenure of a grant from the Agricultural Research Council, to which I wish to express my thanks.

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Macaulay Institute for Soil Research,
Aberdeen.
Sept. 16.

[1] Nagelschmidt, G., *Z. Krist.*, **93**, 481 (1936).
[2] Nagelschmidt, G., "The Mineralogy of Soil Colloids" (Tech. Com. No. 42, Imperial Bureau of Soil Science, Harpenden). p. 15.
[3] See Aldrich, Hellman and Jackson, *Soil Sci.*, **57**, 215 (1944) where references are given to the previous papers of the series.
[4] Nagelschmidt, G., *J. Sci. Instr.*, **18**, 100 (1941).

A Modification of the Method for Estimating the Anti-bacterial Activity of Fungi that are Difficult to Grow on Liquid Media

RECENTLY[1] we published a method which was specially designed to estimate the anti-bacterial activity of certain fungi, for example, the Basidiomycetes, which are difficult to grow on liquid media. Briefly, the method consisted in cutting a disk from a growing fungus colony and dropping it into a plate of warm agar which had been bulk-seeded with bacteria. In case of a positive result a zone of bacterial inhibition was produced round the disk. The method stated that "all disks are cut at approximately the same distance from the edge of the colony". An attempt to determine what distance from the edge of the colony would give the best result brought out certain objections to the method and led to the present modification.

The main difficulty was that the disks did not always produce a zone of inhibition of uniform width; in some cases the width on one side of the disk was twice that on the other side. Assuming the colony was allowed to grow to a diameter of 2½ in., the radius permitted disks of 11 mm. to be cut at different distances from the edge, and it was found that there was variation in the shape of the zone according to whether the disk was cut from near the edge or near the centre of the colony. The zone might be perfectly centric around the disk wherever the disk was cut out; but in most cases it was not. In general, there were two variants on the centric type. Fig. 1 *A* shows a disk (*d*) cut near the edge (*e*) and some distance from the centre (*c*) of the fungus colony.

When the disk was placed in the bacteria-seeded plate, the zone of inhibition might be of the type shown in Fig. 1 *B*, that is, having the widest part of the zone of inhibition at that part of the disk which had been towards the centre of the fungus colony, or it might be of type Fig. 1 *C*, where the widest part of the zone was at that side of the disk which had been farthest from the centre of the colony. The first

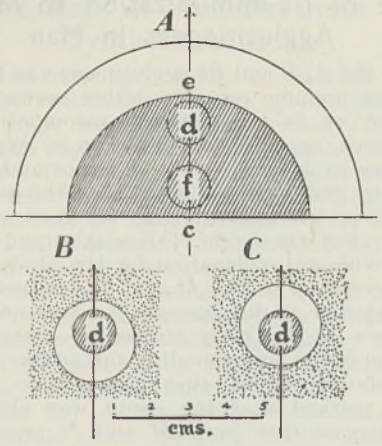

FIG. 1. FUNGUS MYCELIUM SHADED; BACTERIAL COLONIES STIPPLED. EXPLANATION IN TEXT.

type indicated that it was the older region of the mycelium that was producing the greatest concentration of inhibitory substance, the second type indicated that it was the young mycelium near the growing edge that was responsible for the higher concentration. Apart from the interesting fact that in some fungi it is the older and in others the younger part of the mycelium that produces inhibitory substances, apart also from the difficulty of using the method as any more than a positive/negative test, the above variations might be so pronounced as completely to invalidate the results. When two disks were cut from certain fungus colonies, one (*d*) near the edge and the other (*f*) near the centre, the one gave a zone of inhibition, centric or eccentric, but the other gave no zone at all. Hence the position from which the mycelial disk was cut was of paramount importance. To obviate the necessity for cutting more than one disk, the following modification of the method was adopted, and has proved to be quite as simple and more informative than the original.

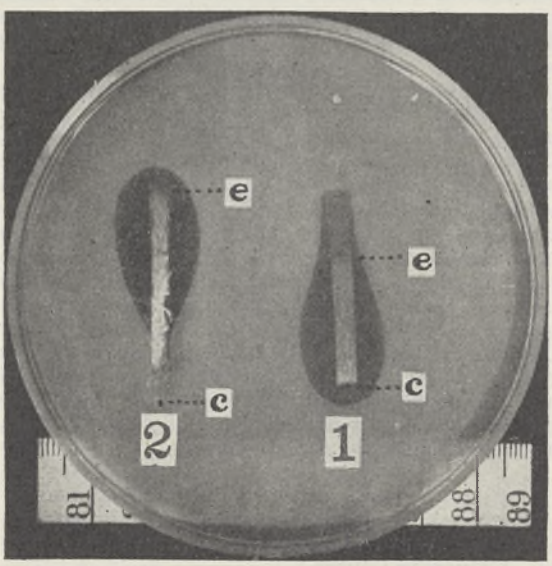

FIG. 2. SHOWING BOTH TYPES OF INHIBITION.

A strip of mycelium and agar 4 mm. wide is cut, by means of a safety razor blade apparatus, right across the centre of the plate containing the fungus colony. This strip is divided at the centre into two equivalent halves, one half is put into a plate of warm agar bulk-seeded with *Staphylococcus aureus* and the other half is put into a similar plate seeded with *Bacterium coli*. Comparable results against the two types of bacteria are thus possible, and comparisons between the effects produced by different fungi and between the effects produced by the same fungus on different media are also facilitated. The sort of result which is obtained is shown in Fig. 2, which is a photograph of two mycelial strips in a plate of *Staph. aureus*.

Strip No. 1 is cut from a growing colony of the basidiomycete fungus *Tricholoma nudum*, a fungus which typically produces the greatest concentration of inhibitory substances from the older region of the mycelium. Strip No. 2 is cut from another basidiomycete, *Clitocybe aurantiaca*, which produces inhibitory substances only from the younger region of the mycelium. The degree of inhibition is determined by measuring the greatest diameter of the zone of inhibition wherever that may be in relation to the mycelial strip. So far as we yet know, growing any given fungus on different media may alter the degree but does not alter the type of inhibition.

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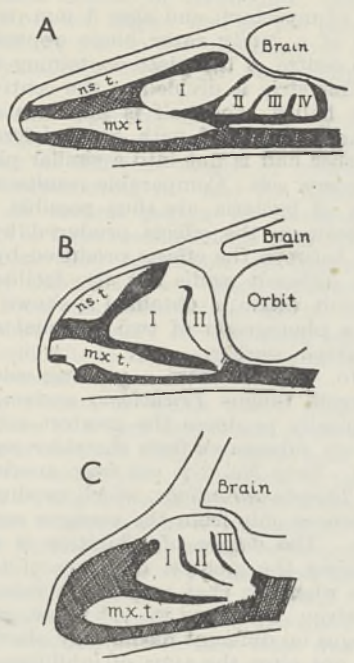
[1] Wilkins, W. H., and Harris, G. C. M., *Nature*, **153**, 590 (1944).

Meristic Variation and Reversibility of Evolution

PROJECTING into the nasal fossa of any generalized metatherian or eutherian mammal is a series of turbinals, namely, a naso-turbinal (Fig. *A*, *ns.t.*), a maxillo-turbinal (*mx.t.*) and four ethmo-turbinals (I–IV), and there can be little doubt that such an arrangement characterized the remote ancestors of the Primates. But in all primitive Primates (from which we exclude the Lemures), including such forms as *Tarsius* (Fig. *B*), *Hapale*, *Chrysothrix* (*Saimiri*), *Cebus* and *Lagothrix*, there are but two ethmo-turbinals (I, II), for in these forms the orbital cavities have so enlarged as to obliterate by their approximation the posterior part of the ancestral nasal fossa. In the baboon, gibbon (Fig. *C*), chimpanzee and gorilla, and in man, the nasal fossæ are again enlarged, partly at least as a result of the growth in width of the skull-base in support of an enlarged brain, and in all these forms three[1], and in man sometimes four[2] or even five[3], ethmo-turbinals may be developed. The phylogenetic trend in Primates seems, therefore, to have been towards a reduction of the turbinal series in early forms and a secondary expansion thereof in certain of their descendants.

Dollo's 'law of irreversibility', even in its modern phrasing: "Evolution is reversible in that structures or functions once gained may be lost, but irreversible in that structures or functions once lost can never be regained"[4]—does not apply here, for ethmo-turbinal III has been lost in primitive Primates and has



reappeared in certain recent forms. Arber[5], quite independently of Dollo, formulated from botanical evidence a 'law of loss', the "general rule that a structure or organ once lost in the course of phylogeny can never be regained; if the organism subsequently has occasion to replace it, it cannot be reproduced, but must be constructed afresh in some different mode", and later collected such data as had been submitted from time to time as evidence contrary to Dollo's law. Such evidence included the re-acquisition of a lost toe in a laboratory race of cavy, the re-development of lateral digits in some horses, the occasional presence of a fifth stamen in anomalous Iris specimens. Arber pointed out that these were all cases of meristic variation and that Dollo's law did not apply to them.

The present instance of the nasal turbinals is also meristic in nature, but is derived from normal anatomy and not from teratology: it is bound up with the fundamentals of Primate evolution.

The ambiguity of Dollo's law depends upon the interpretation of the words 'structure' or 'organ'. Presumably if the entire Primate ethmo-turbinal series had been phylogenetically lost, no single turbinal could ever have been regained: but so long as even one member of the series persisted in primitive Primate forms, the redevelopment in descendant recent forms of the full turbinal complement remained a possibility. It seems advisable, therefore, to add to the law a rider to the effect that, in the case of structures constituting a series, the law applies to the series as a whole, and not to the individual members thereof.

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[1] Cave, A. J. E., and Haines, R. W., *J. Anat.*, **74**, 493 (1940).
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Failure of *Iso*-Immunization to *M* and *N* Agglutinogens in Man

SINCE the *A*, *B* and *Rh* agglutinogens so frequently invoke an immune response, either between mother and baby or as the result of incompatible blood transfusions, speculation has arisen to explain why differences in *M* and *N* type of donor and recipient, or of baby and mother, do not have the same effect.

The *M* and *N* agglutinogens are good antigens in animals; but the work of Kosjakov and Tribulev[1] may provide an explanation for the absence of any regular response to the *M* and *N* antigens in man. In an attempt to demonstrate the presence of these substances in the body tissues by means of the inhibition of the corresponding anti-serum, Kosjakov and Tribulev found that non-specific inhibition was so marked that the result was always such as to suggest that both *M* and *N* were present in the tissue under investigation. They discovered, however, that if, for example, the tissue thought to contain the *M*-group substance was first saturated with an anti-*N* serum it was then capable of specifically inhibiting an anti-*M* serum. Similarly, before specific absorption by *N*-group substance could be demonstrated it had first to be saturated with anti-*M* agglutinins.

This suggests that anti-*M* or anti-*N* agglutinins will only rarely appear in the serum of a mother who is carrying a baby of dissimilar *M* or *N* type, or following a blood transfusion, because of the marked non-specific absorptive capacity of human tissues for these *iso*-agglutinins.

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[1] *J. Immunol.*, **37**, 283 (1939).

Lichen Substances Containing Nitrogen

IT is a matter of interest that, notwithstanding the very large number of substances that have been isolated from lichens, there is only one recorded example of a material containing nitrogen, namely, picroroccellin, isolated by Stenhouse and Groves in 1877 from a variety of *Roccella fuciformis*, and to which they attribute the formula $C_{27}H_{29}O_5N_3$.

From the lichen *Lecanora epanora* we have isolated two yellow nitrogen-containing constituents, rhizocarpic acid and epanorin. Rhizocarpic acid, which is found in many lichens, has hitherto been regarded as consisting solely of carbon, hydrogen and oxygen; we find that it has the formula $C_{28}H_{33}O_6N$ and that, on hydrolysis with strong alkali, it breaks down into methyl alcohol, oxalic acid, phenyl acetic acid and a colourless acid of formula $C_{17}H_{17}O_3N$. Our analytical data for epanorin which, like rhizocarpic acid, contains one methoxyl group, accord best with the formula $C_{21}H_{21}O_5N$; on alkaline hydrolysis it gives rise to methyl alcohol, oxalic acid, phenyl acetic acid and a colourless acid of formula $C_{14}H_{19}O_3N$. The products of hydrolysis indicate $C_{25}H_{25}O_6N$ as an alternative formula for epanorin.

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Alleged Role of Fructofuranose in the Synthesis of Levan

THE view was long widely entertained that cells synthesize macromolecules of polysaccharides and proteins by a reversion of the process of hydrolysis. It has been suggested accordingly that the synthesis of the polyfructoside levan specifically from aldosido< >fructofuranosides (sucrose, raffinose) involves two distinct steps: first, hydrolysis of the substrate; secondly, polymerization of fructofuranose by a condensation involving removal of water[1]. Bacteria which form levan from sucrose do so also from raffinose[2]. This polymerative type of sucrose degradation is concurrent with an ordinary hydrolytic inversion[3,4]. The same bacteria ferment levan[3]. Investigators might be tempted by these correlations to consider the enzyme system, levansucrase, to be but a mixture of invertase and polyfructosidase. It is shown below, however, that this view cannot be valid.

(*a*) Owen[5] added yeast invertase solution to cultures of bacteria growing in a sucrose medium. The addition did not augment but inhibited formation of levan by the cells. The findings suggested that invertase is not an essential component of the levan-forming enzyme, but since it referred to living and proliferating cells a final conclusion in this respect could not be drawn[6]. The recent preparation of cell-free levansucrase from *Aerobacter*[3] has made it possible to carry out Owen's experiment in conditions free from the criticisms to which his earlier attempt is open. It has been found that addition to this levansucrase of yeast invertase in amount sufficient to double the rate of sucrose decomposition does not affect levan production in solutions containing a high initial concentration of sucrose (more than 5 per cent). In solutions containing levan-formation-limiting concentrations of sucrose (less than 2 per cent), addition of yeast invertase to the levansucrase caused inhibition, rather than augmentation, of levan production.

On the view that fructofuranose is the substrate actually polymerized by levansucrase, it is still possible to explain the failure of invertase to accelerate levan production from a non-limiting concentration of sucrose by assuming that in this process hydrolysis, though essential, is not a rate-limiting step. This complicating possibility is eliminated where the rate of levan production is known to be dependent on the sucrose concentration. It is similarly eliminated in reactions carried out on raffinose. Levan is produced much more slowly from raffinose than from an equivalent concentration of sucrose[7]. If the reaction proceeds via fructofuranose, the rate-limiting step on raffinose can only be hydrolysis, subsequent steps by the terms of the theory being identical for both sucrose and raffinose. Yet addition to levansucrase of enough yeast invertase to render the rate of raffinose hydrolysis by the enzyme mixture equal to the rate of conversion of sucrose by levansucrase alone failed to augment, and in the long run inhibited, the rate of production of levan from raffinose. The conclusion is therefore confirmed that invertase is irrelevant to levan production from sucrose and raffinose by levansucrase.

(*b*) There is further direct evidence that fructofuranose is not a substrate which can be polymerized by levansucrase. Isbell and Pigman[8] have concluded on the basis of measurements of optical rotation that fructose in aqueous solution is an equilibrium mixture of fructofuranoses and fructopyranoses. The recent demonstration that glucose-1-phosphate (Cori ester) and fructose form a dynamic equilibrium with sucrose and phosphoric acid in the presence of a specific enzyme[9] corroborates this view. Addition of fructose to sucrose does not inhibit levan production from the latter, yet fructose itself, although it presumably contains ready fructofuranose, is not converted into levan by levansucrase[7]. Similarly, levansucrase fails to form levan from reaction mixtures in which fructofuranose is sustainedly liberated in *statu nascendi*, for example, in reaction mixtures of methyl gamma fructoside + yeast invertase, and of inulin inulase.

(*c*) Extracts of an *Aerobacter*, although they produce levan from sucrose and hydrolyse the latter as well, do not hydrolyse levan. Thus they contain levansucrase and invertase but no polyfructosidase (levanase)[7]. On the other hand, takadiastase and an extract of a *Torula* yeast have been found to hydrolyse levan and inulin as well as sucrose, yet produced no levan from the latter. Thus they contain invertase as well as polyfructosidase yet are without levansucrase.

The conclusion is therefore indicated that fructofuranose is not an intermediary of levan synthesis from aldosido< >fructofuranosides. The view of macromolecular biosynthesis as a reversion of hydrolase action apparently fails to describe levan production, even as it fails to depict the biological production of glycogen and starch.

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Aug. 28.

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A Blind Woodlouse

WHEN examining some specimens of *Armadillidium vulgare* (Latr.), kindly sent to me by Dr. H. W. Howard of Cambridge from the University Farm, I noticed that a female specimen of the variety "Black type B" of Howard[1] was entirely void of eyes or any trace of them. In this example there is no trace of any visual elements or even pigment. The chitin on the cephalon, where the eyes should be, is very slightly convex, shelving down laterally and inwardly.

During the past thirty years, I have examined many thousands of specimens referable to this species, but I have never met with one in which the eyes were absent, or in any other species of terrestrial isopod excepting in truly cavernicolous ones.

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Oct. 2.

[1] *J. Genetics*, **40**, 83, pl. iv, fig. B (1940).

NATIONAL FLOUR AND BREAD

From the Scientific Adviser's Division, Ministry of Food

THIS report, the fifth to be issued[1], covers the samples of flour examined in the period January 1 to September 2, 1944, and loaves from January 1 to October 2.

Quality of Flour

423 samples were analysed with the following results :

Fibre		Vitamin B_1	
Value per cent	Per cent of samples	I.U./gram	Per cent of samples
0·4 or less	10·9	1·1 or more	3·3
0·5 ,,	52·7	1·05 ,,	12·3
0·55 ,,	70·7	1·0 ,,	35·7
0·6 ,,	80·7	0·95 ,,	62·1
0·7 ,,	92·7	0·9 ,,	82·0
0·8 ,,	98·1	0·8 ,,	97·1

The fibre figures are corrected for any added white flour.

Riboflavin, Nicotinic Acid, Iron, Protein, Ash and Maltose. For these determinations the samples received in each of the months January–June inclusive were compounded.

Month	No. of samples	Riboflavin (μgm./gm.)	Nicotinic acid (μgm./gm.)	Iron (mgm./100 gm.)	Protein per cent	Ash* (per cent)	Fibre (per cent)	Maltose (per cent)
January	72	1·2	17	2·15	10·9	1·0	0·50	2·35
February	64	1·2	17	2·12	10·8	0·97	0·50	2·3
March	60	1·3	17	1·94	10·0	0·96	0·50	2·3
April	60	1·4	17	1·98	10·8	0·94	0·50	2·1
May	40	1·4	16	2·01	10·9	0·96	0·50	2·05
June	50	1·3	17	2·20	10·8	1·04	0·50	2·3

* All the flours were fortified with calcium carbonate at the rate of 7 oz. per sack of 280 lb. The ash due to this addition would average 0·12 per cent. No skim milk powder was added after March 1944.

Average figures for National flour in the period were therefore :

B_1	0·95–1·0 I.U./gm.	Protein	10·7 per cent
Riboflavin	1·3 μgm./gm.	Fibre	0·50 ,,
Nicotinic acid	17 ,,	Ash	0·98 ,,
Iron	2·07 mgm./100 gm.	Maltose	2·2 ,,

Granularity. In 1944 (up to October 4) 549 samples of flour have been examined with the following results :

Samples	% over 5 silk	% over 8 silk
1–100	1·2	4·7
101–200	1·1	4·4
201–300	0·8	4·1
301–400	0·7	3·7
401–549	1·0	4·3

Aperture No. 5 silk = 0·270 mm.
,, No. 8 ,, = 0·190 ,,

Baking Quality. All the flours were test-baked under optimum conditions of water absorption and fermentation, and the resulting bread graded according to quality (commercial standards).

257 samples of flour gave good bread = 60·7 per cent of samples.
81 ,, ,, ,, ,, fair-good ,, = 19·2 ,, ,, ,, ,,
67 ,, ,, ,, ,, fair ,, = 15·8 ,, ,, ,, ,,
18 ,, ,, ,, ,, poor ,, = 4·2 ,, ,, ,, ,,

Quality of Bread

3,358 loaves from different parts of Great Britain were graded for quality (commercial standards).

Good	= 461	loaves	= 13·7 per cent
Fair–Good	= 1393	,,	= 41·5 ,, ,,
Fair	= 1027	,,	= 30·6 ,, ,,
Poor	= 477	,,	= 14·2 ,, ,,

It will be observed that the first two groups totalled 55 per cent against 80 per cent for the flours baked under ideal conditions in the laboratory.

This work was carried out at the Cereals Research Station, Ministry of Food, St. Albans.

[1] See *Nature*, **149**, 460 (1942); **150**, 538 (1942); **151**, 629 (1943); **153**, 154 (1944).

PHYSICO-CHEMICAL ANALYSIS IN U.S.S.R.

IN 1904 Prof. N. S. Kurnakov (1860–1941) invented a new form of recording pyrometer which was a great improvement on that of Roberts-Austen. In 1910 Prof. A. A. Baikov still further improved this pyrometer by a modification which allowed the recording of the differential curve to be superimposed on the ordinary cooling or heating curve. This apparatus provided a very delicate method for the thermal analysis of alloys and minerals, called by Kurnakov in 1913 'physico-chemical analysis'[1]. Through the initiative and enthusiasm of Kurnakov, a very flourishing school of research was established, and in 1918 a special Institute of Physico-Chemical Analysis was founded at the Academy of Sciences.

The scope and purpose of this Institute was defined by Kurnakov in the following words : "The Institute of Physico-Chemical Analysis has for its aim the study of the relations between the composition and the measurable properties of systems in equilibrium of two or more components. Being in reality one of the subdivisions of general chemistry, physico-chemical analysis can be of a wide application in the border regions of theoretical and applied science —mineralogy, petrology, geology, metallurgy and applied and structural mechanics. It is a very significant fact that a systematic investigation of the diagram 'composition-properties', the essential method of this new chemical discipline, allows us to draw conclusions about the nature of solid, liquid or gaseous substances, without subjecting them to the usual chemical operations of separation. Because of that, a whole range of substances—alloys, glasses, slags, rocks, liquid and solid solutions, colloidal systems and various ores—are now included within the range of a systematic chemical investigation"[2].

In 1940 the friends of N. S. Kurnakov decided to celebrate his eightieth anniversary by publishing a special volume of collected papers. The sad event of Kurnakov's death on March 19, 1941[3], made it necessary to recast the proposed volume and a memorial volume was published instead[4]. This volume contains twenty-nine articles written by Kurnakov's close associates and friends. The first eight articles deal with the biography, bibliography and the scientific work of Kurnakov. Every application of the physico-chemical analysis—alloys, organic

and complex compounds, minerals and ores—is discussed in a special article by a leading authority on this subject. The remaining articles deal with original research and they include the following topics: thermographic methods, viscosity of liquid systems, properties of various chemical systems and alloys, potash salts, etc. The volume is well printed and provided with the portrait of N. S. Kurnakov and numerous plates of photomicrographs and diagrams. Unfortunately there are no English summaries.

It is rather difficult to give an adequate account of the achievements of Kurnakov's school of research, but specialists in given branches of chemistry and other sciences are probably acquainted with the abstracts of Russian papers and with the papers published in the *Z. anorg. Chem.* and *J. Inst. Metals*. The whole range of these publications can be roughly assigned to three sections: (1) metals, (2) minerals and ores, and (3) general chemistry. The works dealing with metals are chiefly concerned with the thermal study of alloys from the point of view of the phase rule, and a very detailed correlation of the composition with viscosity, hardness, electro-conductivity, etc., is usually made. The works dealing with minerals and ores cover a wider ground. First in order of importance comes the study of the equilibrium of salt solutions, a study which not only made a valuable contribution to theoretical science but also greatly helped in the development of Russian salt deposits and the salt industry. The application of physico-chemical analysis to other minerals and ores has embraced practically all classes of minerals: silicates, carbonates, oxides, borates, native elements, etc. Probably the most outstanding achievement was the study of the minerals of the platinum group, clay minerals and bauxitic minerals, a work which had a most important practical application in the U.S.S.R. Of the problems concerned with the general chemistry one may mention the study of organic compounds, compounds with complex radicals, the general study of equilibrium systems and the topology of the equilibrium diagram.

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[3] Briscoe, H. V. A., *Nature*, 148, 310 (1941).

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SOLAR RADIATION OBSERVATIONS AND VOLCANIC DUST

IT was observed by Dr. C. G. Abbot that dust from the Alaskan volcano Katmai in June 1912 affected the transparency of the atmosphere in the northern hemisphere, but failed to influence the pyrheliometric observations at Arequipa, Peru. This led George G. Gallagher of Glendale, California, to inquire whether or not dust from southern hemisphere volcanoes influenced the atmosphere in the northern hemisphere. This matter has just been investigated by L. B. Aldrich from the records of the Smithsonian solar-radiation stations for the Chilean Andes eruptions of April 1932*.

* "Smithsonian Pyrheliometry and the Andean Volcanic Eruptions of April 1932", by L. B. Aldrich. *Smithsonian Misc. Coll.*, 104, No. 6, July 3, 1944.

The Andean eruptions of 1932 started on April 10, involving some seven volcanoes extending two hundred miles along the Chile–Argentine border from Tupungato (altitude 2 ,000 ft., lat. 33·5° S.) southward to Quizapu (altitude about 10,000 ft.). Loud explosions were heard 100 miles on either side of the volcanoes. The explosions continued for three days. Surrounding towns were in semi-darkness owing to the steady fall of dust and ashes. In Montevideo, 850 miles away, the steady fall of dust continued for many hours. The late Dr. C. Davison estimated the fall of dust over the area to be more than five cubic miles. Capt. R. Wooten, United States Air Attaché at Santiago, who flew across Quizapu at an altitude of 14,000 ft., estimated that at the time of greatest activity the smoke column rose to a height of 30,000 ft. Evidences of unusual dust in the atmosphere were noted at Wellington, New Zealand, on May 7, reaching a maximum about May 26. Unusual skies were also reported during May from various places in South Africa.

During this time the Smithsonian Institution was operating solar-radiation stations at Montezuma (latitude 22° 40′ S., longitude 68° 56′ W.) and at Table Mountain, California (latitude 34° 22′ N., longitude 117° 41′ W.). At both these stations, on all days when the sky around the sun was clear, observations were made with the silver-disk pyrheliometer, measuring the total solar radiation received upon a surface normal to the radiation. Simultaneously, readings were taken with a pyranometer, measuring the brightness of the sky in a circular zone about 10° wide, concentric with the sun. These pyranometer readings are an index of the quantity of dust in the atmosphere. Values of pyrheliometry and pyranometry at air mass 2·0 (solar altitude 30°) were selected from the observations and used uncorrected to mean solar distance. These were grouped by months and so chosen that the average amount of water vapour in the air above the station was the same in each year for a given month. The amount of water vapour in the air may be represented by the spectrobolometrically determined precipitable water value. The year 1930 was taken as a standard for comparison. The following tables, obtained by L. B. Aldrich, indicate the results of the investigation.

PERCENTAGE DEVIATIONS OF PYRHELIOMETRY AND SOLAR CONSTANTS FROM CORRESPONDING MONTH OF 1930.

	Pyrheliometry		
	Montezuma	Table Mountain	Solar Constant
Month	per cent	per cent	per cent
May 1932	— 3·7	+ 0·8	— 0·4
June ,,	— 3·4	— 0·5	— 0·1
July ,,	— 2·6	— 0·1	— 0·1
Nov. ,,	— 2·1	— 0·0	— 0·2
May 1933	— 0·1	— 0·4	— 0·4

PERCENTAGE CHANGE OF SKY BRIGHTNESS AROUND THE SUN FROM CORRESPONDING MONTH OF THE YEAR 1930.

Month	Montezuma	Table Mountain
	per cent	per cent
May 1932	+ 157	— 23
June ,,	+ 114	— 3
July ,,	+ 87	— 5
Nov. ,,	+ 44	+ 1
May 1933	— 19	+ 8

No effect of the Andean eruptions is discovered in the Table Mountain, California observations. A definite effect occurs in the Montezuma pyrheliometer values, with a maximum of 3·7 per cent depletion in May 1932, and an average of 3·0 per cent for the months May, June, July, November. This agrees with Mr. Gallagher's estimate.

From the Montezuma records, the following unusual sky observation reports are taken (1932: C. P. Butler, director).

April 13. Horizon to south very hazy with yellowish-looking dust. Nothing further is noted until—

April 22. Good sky. Very hazy over mountains to east.

April 23. Very heavy layer of yellowish haze over mountains to east, extending up to about 10°.

April 24. Very poor sky. Streaks from horizon to zenith, with whitish glare about sun.

April 25 and 26. Same notes as on April 24.

April 27 through 30. Dust in atmosphere almost totally obscures sun.

On April 30 the pyranometer value at air mass 2·0 was 0·131 calorie—ten times the normal value.

It should be noted that Montezuma is more than eight hundred miles north of the erupting volcanoes.

CARE OF THE WOUNDED

THOSE who had the experience of being transported, after the War of 1914–18, from, say, the less civilized Iraq of those days to a bed in one of the temporary military hospitals in England considered that they were being handled by an organization which it would be difficult to improve. But we realize, when we read the three articles contributed by a Special Correspondent to the *Lancet* (253, August 19, 1944; 278, August 26, 1944; 383, September 16, 1944), how much more is now being done for the wounded and the sick. These three articles on the wounded from Normandy must be read; they cannot be summarized. They explain why the casualty-rate among the wounded has been low. The doctor and the medical organization go right forward into the battle; paratroops and tanks have their field ambulances; the soldier knows much more about first-aid and about how to keep himself fit; surgical treatment is given early; blood transfusions are given much earlier; penicillin is available everywhere; and air transport, described in the second article, has been well organized. When they get to Britain, the wounded pass into the hands of the home hospital services and their network of ancillary organizations, which extend right back to the humblest civilian who goes along, when he is asked to do so, to give a pint of blood. The destinies of that blood have been described in the Press and pictured on the cinema screen. They are symbolic of the whole service. It is to be hoped that, after the War, this organization will be applied to national life in peace as well as in war, and that the soldier will bring back into civil life the knowledge of how to keep fighting fit which the R.A.M.C. has taught him so well that "nothing like it has ever been done either in military or civil life".

For those who are interested in this subject, the article entitled "Military Surgery in Geographical Perspective", by Ian Aird, late Lieut.-Colonel R.A.M.C. (*Edinburgh Med. J.*, 51, 166; April 1944) will be of great interest. The author deals with surgical strategy and tactics in Libya and discusses the influence of the physiography, climate, water supply, soil bacteriology, dust and sand storms, populations and communications of Libya on the planning of surgery for the campaign there. Little help was obtained from the history of previous North African campaigns. The rapid movement of the war there demanded mobile, self-contained units, and the caravan- and tent-operating theatres used are shown in photographs. The rest of the article describes the surgical technique employed, the water shortage and evacuation of the wounded by air. It may be compared with many other articles on the treatment of war wounds which have appeared in the medical Press.

Almost as frequent have been articles on the transport of the wounded or of those injured in air raids. Among these there have been numerous descriptions of stretchers designed for rapid transport of injured people and adapted for use for artificial respiration as well. D. G. Duff (*Lancet*, 798, June 17, 1944; see also the *Lancet*, 739, June 3, 1944) describes one of these stretchers. Dr. Duff's stretcher is the result of experiments made over six years, experience of climbing accidents being included. Photographs of it illustrate its use. It is comparable in weight and ease of production to the standard army stretcher, and can be used as a breech buoy and for Eve's rocking method of artificial respiration. Runners beneath it enable it to "be its own vehicle" on any slope and on rock, grass, scree, heather, ice and snow; or it can be used for lowering a patient from a window. A wheeled undercarriage is available and a collapsible form of it can be got into a package 4 ft. 6 in. × 10 in. × 4 in.

BIOLOGICAL STUDIES IN BRAZIL

BRAZILIAN biologists and medical men have made, and are making, valuable contributions to knowledge. The wide field which they cover is indicated, not only by their medical journals, but also by the policy of some of their biological periodicals, which publish articles on subjects which, in other countries, would be printed in medical literature. Thus the *Revista Brazileira de Biologia* (3, No. 4; 1943) contains papers on immunology, such as those on protection tests with Felix's antityphoid serum, on oxidation and reduction of complement and on the antibodies to the virus of equine encephalomyelitis; and others on cryo-epilepsy, on Henry's melano-flocculation reaction and on Wolff's buffer-precipitation test in malaria, Chagas's disease and schistosomiasis. Another paper discusses the action of acetylcholine and of adrenalin on the coronary arteries of the Brazilian macacus monkey, *Allouata fuscus*. The rest of this issue deals with more specifically biological subjects. Thus there are articles on two Lepidoptera, *Automolis* and *Rhipha*; and on the unity or duality of the males of the hymenopterous parasite, *Telenomus fariai*, in which the author concludes that the two classes of males are morphologically identical, produce the same progeny from the female and always have ten chromosomes, while the female has twenty. Their difference in size depends on the amount of food that is available. Other articles deal with a new trematode species, *Catadiscus mirandai*, from the large intestine of *Hemipipa carvalhoi*, with some spiders of Chile, with two new species of *Stenolemus* (Reduviidæ, Hemiptera) and with the hyoid and laryngeal apparatus of some Microchiroptera. Botanists will be interested in the article on the nomenclature of *Capsicodendron Dinisii* (syn. *C. pimentiera*, Canellaceæ). The social importance of scientific investigation is discussed by Dr. Oswaldo Cruz, of the famous Institute which bears his name.

Another Brazilian biological journal, *Zoologia* (No. 7. 1943. Boletim 32, Universidade de São Paulo, Brasil), although chiefly biological, contains a paper by Paulo Sawaya on the occurrence of acetylcholine in the cardiac tissues of the marine crab, *Callinectes dancæ*, which "is perhaps the commonest swimming crab in Brazil". A large quantity of acetylcholine was found in the cardiac tissue. The technique of attempts to perfuse the heart is described and the effects on the heart of acetylcholine, eserine, atropine, nicotine and adrenalin are described. Extracts of the cardiac tissue of *Callinectes dancæ* contained substances which acted like acetylcholine on the hearts of the amphibians *Bufo marinus* and *Siphonops annulatus*. The experiments indicated that *Siphonops annulatus* can be used for testing the action of acetylcholine. Five plates record the kymograph tracings (cardiograms) obtained with the hearts of these three species.

The greater part of this issue is, however, occupied by a paper of 246 pages on the Naididæ of Brazil, by Ernesto Marcus, with a summary in English of ten pages, a bibliography of seven pages and 33 plates. The paper discusses the structure, bionomics and taxonomy of 24 species, all found near the city of São Paulo and in the State of São Paulo. They belong to the genera, *Chætogaster*, *Nais*, *Dero*, *Aulophorus*, *Pristina* and *Naidium*. Some problems of variability, morphogenesis, regeneration and histology are considered.

In the same volume, Michel P. Sawaya discusses the intrazoœcial rings of the Crisiid Bryozoa, and Domingos Valente describes his work on the effect of numbers of individuals on the oxygen consumption of the crab *Trichodactylus petropolitanus*, which normally lives in darkness under stones and water plants in rivers. The author concludes that the isolated animal uses oxygen at a greater rate than do groups of four crabs; and two crabs used more than four. This group effect is not eliminated by darkness. The effect of visual stimuli on oxygen consumption was studied in crabs placed in relation to their own mirror images in aquaria mirrored on one vertical side. The oxygen consumption of isolated crabs thus placed in contact with their own mirror images was decreased. Mirror image and group effects are thus both positive, but the former were not very marked.

G. LAPAGE.

SYSTEMATICS OF THE POTATO

A THOROUGH understanding of potato taxonomy is a necessary pre-requisite of a large-scale programme of breeding for new types. With this in view the British Empire Potato Collecting Expedition sent out by the Imperial Agricultural Bureaux during 1938–39 made extensive collections in Mexico and South America. The systematic results are now described by Dr. J. G. Hawkes (Imperial Bureau of Plant Breeding and Genetics, Cambridge, pp. 142, June 1944, 7*s*. 6*d*.), who has classified all the material obtained on a basis of morphological, geographical and cytological criteria. Five new cultivated and thirty-one new wild species are described in addition to very many new varieties and forms; but although some twenty cultivated and one hundred and fifty wild species of potato are now known, it is concluded that, at least so far as the wild species are concerned, the wealth of variation still lies practically untouched, and probably three or four times as many wild species await discovery in the less accessible regions.

The cytological investigation of the collections shows that it is only in Mexico that the whole polyploid series occurs. Here only six diploid species are known, whereas tetraploid, pentaploid and hexaploid types are common. In South America diploid wild species are the rule, and there are no pentaploid or hexaploid wild species and only one pentaploid cultivated species. Among cultivated species in every country tetraploid clones occur much more frequently than diploids, triploids and pentaploids.

As regards the origin and evolution of cultivated potatoes, reasons are advanced for supposing that moderately high-yielding wild potatoes were first taken into cultivation in the Lake Titicaca – Cuzco region of north Bolivia and south Peru. Light is thrown upon the problem as to which types of potato were first cultivated by an analysis of the different kinds of weed and semi-cultivated species. This leads to the conclusion that the tetraploid weed species may be either types that had once been cultivated and have now been replaced by higher-yielding varieties of *S. andigenum*, or amphidiploids which were never cultivated to any great extent. The diploid species, on the other hand, are probably the wild species most closely related to our cultivated diploids from which the tetraploids arose before or after their being taken into cultivation. The two tetraploids *S. andigenum* and *S. tuberosum* (*s.str.*) are considered to have had a common origin in the south Peru – north Bolivia region and not to have been derived from distinct wild species, while the evidence as to the origin of the European potato is thought to favour an introduction from the Andes, and most probably Columbia, rather than Chile as has been supposed.

STRUCTURE OF THE WALLS OF PHLOEM FIBRES

R. D. PRESTON (*Chronica Botanica*, 7, 414; 1943) points out that there is now considerable scope for the botanist, and especially the biophysicist, to make his contribution to the knowledge of the fine structure of the cellulose walls of plant cells.

Owing to their commercial value, the fibres of the phloem (sclerenchyma) have so far been chiefly studied; in these the X-ray diagram indicates the presence of cellulose chains in the longitudinal direction only, while observations on swollen walls by optical methods have led to the view that at least two layers are present and that they differ in direction of the cellulose chains. Crossed cellulose chains definitely occur in the walls of certain algæ. The X-ray diagrams of hemp and jute fibres reveal the presence of only one direction of cellulose chains which runs parallel with the major extinction plane and remains unaltered during thickening processes of the fibre walls.

However, by optical examination of swollen walls, there is indication of heterogeneity in cross-section which does not appear to be accounted for in entirety by the differential distribution of lignin and pectin. The latter causes also differential swelling of the wall in different regions and leads to the production of striations of various kinds; also the swollen material is easily broken into separate fibrils with associated change in direction of cellulose chains, which appears to have misled at least one worker. Swelling under

certain conditions produces a 'ballooning' of the outer layer of the wall in hemp, but not in jute, and this fact, taken in conjunction with associated optical phenomena, suggest that the outer layer in hemp and the inner in jute differ appreciably from the rest of the wall.

It seems clear that in such walls the aggregates of the cellulose complex must differ in their association with one another in the different layers. Comparisons with long collenchyma cells suggest that the optical heterogeneity may be due to a variation in *angular dispersion* of the cellulose chains from layer to layer; this argument is less convincing for hemp and jute fibres, but not precluded by the X-ray diagram. There is therefore still doubt as to whether any chains exist in the secondary walls of these phloem fibres other than those which run in the longitudinal direction.

FORTHCOMING EVENTS

Saturday, November 4

ROYAL AERONAUTICAL SOCIETY (at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1), at 10.30 a.m.—Discussion on Civil Aviation. General Critchley: "The Selection and Training of Personnel for Civil Aviation"; Major Thornton: "The Economics of Air Transport"; Mr. Roy Chadwick: "Civil Aircraft Design"; Mr. E. W. Hives: "Civil Aero-Engine Design"; Mr. W. P. Hildred: "Route Facilities (Radio, Aerodromes, Meteorology, etc.)".

GEOLOGISTS' ASSOCIATION (at the Geological Society of London, Burlington House, Piccadilly, London, W.1), at 2.30 p.m.—Dr. L. Hawkes: "On Jet Coal in the Chalk of Kent".

Monday, November 6

FARMERS' CLUB (at the Royal Empire Society, Craven Street, Strand, London, W.C.2), at 2.30 p.m.—Mr. J. L. Davies: "The Policy of Expansion of our Dairy Farming".

SOCIETY OF CHEMICAL INDUSTRY (at the Chemical Society, Burlington House, Piccadilly, London, W.1), at 2.30 p.m.—Dr. A. Batley: "Use of Sensitized Metal in Engineering Design".

ROYAL GEOGRAPHICAL SOCIETY (at Kensington Gore, South Kensington, London, S.W.7), at 5 p.m.—Lord Rennell of Rodd: "Italian East Africa in 1941".

Tuesday, November 7

ROYAL INSTITUTION (at 21 Albemarle Street, Piccadilly, London, W.1), at 5.15 p.m.—Mrs. Jacquetta Hawkes: "Prehistoric Britain", (i) "The Early Colonizations".

INSTITUTION OF CIVIL ENGINEERS (at Great George Street, Westminster, London, S.W.1), at 5.30 p.m.—Mr. F. E. Wentworth-Sheilds: Presidential Address.

SHEFFIELD METALLURGICAL ASSOCIATION (joint meeting with the SHEFFIELD AND DISTRICT BRANCH OF THE INSTITUTE OF WELDING) (at the Royal Victoria Station Hotel, Sheffield), at 6.30 p.m.—Mr. H. F. Tremlett: "Arc Welding Problems—Some Notes on Metallurgical Solutions".

INSTITUTION OF ELECTRICAL ENGINEERS (LONDON STUDENTS' SECTION) (at Savoy Place, Victoria Embankment, London, W.C.2), at 7 p.m.—Mr. C. C. Barnes: "Notes on the Design and Manufacture of Impregnated Paper Insulated Power Cables".

QUEKETT MICROSCOPICAL SOCIETY (at the Royal Society, Burlington House, Piccadilly, London, W.1), at 7 p.m.—Exhibits.

Wednesday, November 8

INSTITUTE OF FUEL (NORTH-WESTERN SECTION) (at the Engineers' Club, Manchester), at 2.30 p.m.—Brains Trust on "The Efficient Utilisation of Industrial Waste and Town's Refuse".

SOCIETY OF CHEMICAL INDUSTRY (FOOD GROUP) (joint meeting with the MICROBIOLOGICAL AND NUTRITION PANELS) (at the Chemical Society, Burlington House, Piccadilly, London, W.1), at 2.30 p.m.—Dr. B. C. J. G. Knight: "Some Wider Aspects of Nutritional Studies with Micro-Organisms".

CHEMICAL SOCIETY (joint meeting with the MANCHESTER UNIVERSITY CHEMICAL SOCIETY and the ROYAL INSTITUTE OF CHEMISTRY) (in the Chemistry Lecture Theatre, The University, Manchester), at 5 p.m.—Prof. L. M. Heilbron, F.R.S.: "Chemistry in relation to National Prosperity".

INSTITUTION OF ELECTRICAL ENGINEERS (TRANSMISSION SECTION) (at Savoy Place, Victoria Embankment, London, W.C.2), at 5.30 p.m.—Mr. D. B. Irving: "Cable Terminations".

Thursday, November 9

ROYAL INSTITUTION (at 21 Albemarle Street, Piccadilly, London, W.1), at 2.30 p.m.—Sir James Jeans, O.M., F.R.S.: "Old and New Descriptions of the Astronomical Universe", (ii) "Stars".

PHYSICAL SOCIETY (at the Royal Society, Burlington House, Piccadilly, London, W.1), at 5 p.m.—Prof. S. K. Mitra: "The Night Sky".

INSTITUTION OF ELECTRICAL ENGINEERS (INSTALLATIONS SECTION) (at Savoy Place, Victoria Embankment, London, W.C.2), at 5.30 p.m.—Mr. F. C. Fuke: "Electrical Accessories for Domestic Purposes—Some Notes on their Design and Installation".

SOCIETY OF CHEMICAL INDUSTRY (EDINBURGH AND EAST OF SCOTLAND SECTION) (in the Anatomy Lecture Theatre, The University, Teviot Place, Edinburgh), at 5.30 p.m.—Prof. Sir Alexander Fleming, F.R.S.: "Antiseptics" (Lister Memorial Lecture).

PHARMACEUTICAL SOCIETY (at 17 Bloomsbury Square, London, W.C.1), at 7 p.m.—Mr. A. L. Bacharach: "Properties and Uses of Penicillin in relation to Pharmacy".

Friday, November 10

ASSOCIATION OF APPLIED BIOLOGISTS (in the Metallurgical Lecture Theatre of the Imperial College of Science and Technology, South Kensington, London, S.W.7), at 2 p.m.—Discussion on "Nomenclature Problems of the Applied Biologist".

ROYAL INSTITUTION (at 21 Albemarle Street, Piccadilly, London, W.1), at 5 p.m.—Mr. G. M. Young: "Equality".

CHEMICAL SOCIETY (SHEFFIELD SECTION) (joint meeting with the SHEFFIELD UNIVERSITY CHEMICAL SOCIETY) (in the Chemistry Lecture Theatre, The University, Western Bank, Sheffield), at 5.30 p.m.—Prof. W. Wardlaw: "Co-ordination Compounds".

APPOINTMENTS VACANT

APPLICATIONS are invited for the following appointments on or before the dates mentioned:

PESTS CONTROL ORGANIZER (temporary) for the County of Montgomeryshire—The Executive Officer, Montgomeryshire War Agricultural Executive Committee, County Offices, Welshpool, Mont. (November 7).

ELECTRICAL ENGINEER AND MANAGER of the Metropolitan Borough of Southwark Electricity Department—The Town Clerk, Southwark Town Hall, Walworth Road, London, S.E.17 (endorsed 'Electrical Engineer and Manager') (November 8).

LECTURER (temporary) IN GARDENING, BIOLOGY AND ELEMENTARY SCIENCE in the Caerleon Training College (men)—The Acting Director of Education, Higher Education Department, County Hall, Newport, Mon. (November 11).

EDUCATIONAL PSYCHOLOGIST—The Director of Education, County Offices, Oxford (November 11).

SPEECH THERAPIST—The Director of Education, Education Offices, Woodlands Road, Middlesbrough (November 11).

LECTURER IN PRODUCTION ENGINEERING, in Courses (both part-time Day and Evening) leading to Ordinary and Higher National Certificates—The Principal, Derby Technical College, Normanton Road, Derby (November 15).

DRAINAGE OFFICERS (2), and a WATER SUPPLIES OFFICER—The Executive Officer, Shropshire War Agricultural Executive Committee, County Buildings, Shrewsbury (November 18).

OFFICER IN CHARGE of the Government's Agricultural Training Scheme for ex-Service men and women in the County of Norfolk—The Secretary, Norfolk War Agricultural Executive Committee, Sprowston, Norwich (November 18).

EXAMINER IN CHEMISTRY for the Higher School Examination for the year 1945—The Secretary to the Matriculation and School Examination Council, University of London, at Richmond College, Richmond, Surrey (November 20).

ASSISTANT LECTURER AND DEMONSTRATOR IN ZOOLOGY, preferably with special qualifications in Experimental Zoology—The Registrar, University College, Cathays Park, Cardiff (November 30).

UNIVERSITY CHAIR OF CONCRETE TECHNOLOGY tenable at Imperial College of Science and Technology—The Academic Registrar, University of London, c/o Richmond College, Richmond, Surrey (February 26).

LABORATORY ATTENDANT IN THE DEPARTMENT OF ZOOLOGY—The Secretary, Bedford College for Women, Regent's Park, London, N.W.1.

LABORATORY STEWARD OR LABORATORY TECHNICIAN—The Registrar, The University, Bristol 8.

SENIOR SCIENTIFIC ASSISTANT IN THE DEPARTMENT OF ECONOMICS—The Principal, Harper Adams Agricultural College, Newport, Shropshire.

MANAGER OF THE INTELLIGENCE DEPARTMENT—The Secretary, British Cast Iron Research Association, Alvechurch, Birmingham.

AGRICULTURAL TRAINING OFFICER to organize the scheme for the training in Agriculture and Horticulture of men and women released from War service—The Secretary, Berkshire War Agricultural Executive Committee, 1 Abbot's Walk, Reading.

REPORTS and other PUBLICATIONS

(not included in the monthly Books Supplement)

Memoirs of the Cotton Research Station, Trinidad. Series A: Genetics. No. 21: The Inheritance of Lint Colour in Asiatic Cottons. By R. A. Silow. Pp. 39. 2*s*. 6*d*. No. 22: The Genetic Organization of Leaf-Shape Development in the Genus Gossypium. By S. G. Stephens. Pp. 25. 2*s*. 6*d*. No. 23: The Genetics of Species Development in the Old World Cottons. By R. A. Silow. Pp. 16. 2*s*. 6*d*. Series B: Physiology. No. 16: (i) Studies on Foliar Hydration in the Cotton Plant, (iii) Preliminary Observations using the Pruning Method, (iv) The Influence of Composition and Concentration of Nutrient Solution, by E. Phyllis and T. G. Mason; (v) A Further Experiment with Potassium, by T. G. Mason and E. Phyllis; (2) Studies on the Partition of the Mineral Elements in the Cotton Plant, (iv) More about Nitrogen, Phosphorus and Labile Carbohydrate, by T. G. Mason and E. Phyllis. Pp. 42. 2*s*. 6*d*. (London: Empire Cotton Growing Corporation.)

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